

**DETERMINANTS OF ANTHROPOMETRIC MEASUREMENT USE AMONGST  
DIETITIANS.**

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In partial fulfilment of the requirements for the degree of:

**Masters of Science Nutrition and Dietetics**  
(BI7038)

University of Chester

Submission: 1: November 2010

Word Count: 17,155

## **ACKNOWLEDGEMENTS**

I wish to acknowledge and thank all participants for their time and efforts, without their contribution this research would not have been possible.

I would also like to thank my work colleagues and friends for their support and understanding.

My supervisor, Dr Eva Almiron-Roig, has been an inspiration and excellent support throughout the whole project – thank you - I hope to have done you proud.

And, of course, to Stephen. Thank you for being you.

## ABSTRACT

**Background:** Nutritional assessment, including the measurement and interpretation of anthropometric data, is a pivotal part of the dietitian's role. However, the extent to which dietitians use anthropometry in their day-to-day activities is poorly documented. Anecdotal evidence suggests that this is below ideal levels. Attitudes and perceived barriers towards the use of anthropometry may further differ by work setting and patient group (e.g. between acute and community-based dietitians). In order to evaluate factors influencing the use of anthropometry amongst dietitians, sensitive, validated tools are needed. Visual analogue scales (VAS) are easily used and interpreted, but have not been validated for assessing confidence levels, in particular when taking body measurements.

**Aims:** This study investigated the use of, and barriers/attitudes towards taking anthropometric measurements amongst dietitians using a cross-sectional survey. For this, a new type of confidence scale (VAS-based) was validated against two other commonly used scales (the Likert and the general-labelled magnitude scale, gLMS).

**Design and procedure:** A pre-piloted questionnaire including confidence scales and attitudinal scales was sent to all NHS dietitians in the North West of England between March-April 2010. The pilot sample (n=32) rated their perceived confidence at taking various anthropometric measures using VAS, Likert and gLMS scales on 2 separate occasions, with scale order randomised.

**Results:** ANOVA and Bland-Altman plot tests indicated VAS to be as sensitive and as reproducible as Likert; VAS also had greater level of agreement with Likert than gLMS, therefore VAS were chosen for the final questionnaire. Of the 397 questionnaires posted, 213 (54%) were returned. Highest confidence ratings were for BMI, height and weight, and lowest for BodPod and head circumference measurements. Average confidence scores across all measurements were lower for community dietitians compared with acute dietitians (mean  $\pm$  SEM scores for community: 54.21  $\pm$  14.78 mm; vs. acute: 60.27  $\pm$  12.11 mm;  $p < 0.05$ ). The majority of anthropometric measures were reported to be taken on an infrequent basis ('Never'/'Less than monthly'). Height, weight and BMI were the most commonly used. Significantly more acute than community dietitians used 'estimated' (50% vs. 11.3%) and 'recalled' weight (50% vs. 11.4%) on a daily basis. The most common barriers against taking measurements were 'Not appropriate for patient', 'Lack of equipment' and 'Time/work load constraints'. Significantly more acute responders reported 'Time' (81.4%,  $\alpha = 0.003$ ) and 'Confidence' (75.5%,  $\alpha = 0.05$ ) to be barriers to anthropometry use. Beyond half of the sample (61%) would attend future training, primarily to increase confidence and competency.

**Conclusions:** Regardless of the importance/reported benefits of anthropometry, it is performed to a very limited degree by dietitians in the North West and is often limited to estimates, BMI, heights and weights. There are numerous barriers to anthropometry use for acute and community dietitians, namely time, equipment and confidence. It may therefore be unrealistic to expect many anthropometric measures to be taken and training should be adapted to reflect the reality of practice. This study also supports the use of VAS scales when assessing dietitians' confidence at taking anthropometric measurements as a sensitive and reliable tool compared to the more widely used, however less sensitive, Likert scales.

## DECLARATION OF ORIGINAL WORK

"I hereby declare that work contained herewith is original and is entirely my own work (unless indicated otherwise). It has not been previously submitted in support of a Degree, qualification or other course."

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## **LIST OF ABBREVIATIONS**

ANOVA - Analysis of Variance  
BAPEN - British Association of Parenteral and Enteral Nutrition  
BMI - Body Mass Index  
CVD- Cardiovascular Disease  
DEXA - Dual Energy X-ray Absorptiometry  
DoH - Department of Health  
gLMS - General labeled magnitude scale  
H0 - Null hypothesis  
H1 – Alternative hypothesis  
HPC - Health Professions Council  
IRAS - Integrated Research Application System  
LMS – Labeled Magnitude Scale  
MAC - Mid Arm Circumference  
MAG – Malnutrition Advisory Group  
MNA - Mini Nutritional Assessment  
MUAMC - Mid Upper Arm Muscle Circumference  
'MUST' - Malnutrition Universal Screening Tool  
NHS - National Health Service  
NICE - National Institute for Health and Clinical Excellence  
NIH -National Institution for Health  
NPSA - National Patient Safety Agency  
NRES - National Research Ethic Service  
NRI - Nutritional Risk Index  
PCT - Primary Care Trust  
PENG - Parenteral and Enteral Nutrition Group  
PNI - Prognostic Nutritional Index  
SGA - Subjective Global Assessment  
UK - United Kingdom  
VAS - Visual Analogue Scale  
WC - Waist Circumference  
WHO - World Health Organisation  
WHR - Waist to Hip Ratio

## **1. INTRODUCTION**

### **1.1. Background**

A fundamental component of the practice of a dietitian is the assessment of nutritional status and associated risks. There is no one standard way of assessing nutritional status, but the process typically involves the consideration and interpretation of physiological requirements, nutritional intake, body composition and function, as nutritional status is not a static entity (Thomas & Bishop, 2007). Methods and parameters investigated will vary according to individual circumstances (Charney, 1995 cited in Thomas & Bishop, 2007) and may need to include: clinical, physical, dietary, anthropometric and biochemical and/or haematological considerations (Baxter, 1999).

Anthropometry is the study/assessment of body composition in living people and indicates health and nutritional status. It is used to predict performance, health and survival (World Health Organisation [WHO], 1995; Thomas & Bishop, 2007). Anthropometric measurements can be used to detect moderate and severe forms of malnutrition (both under and over nutrition), and are of particular use when chronic protein and energy imbalances have occurred – although cannot identify specific nutrient deficiencies (Gibson, 2005). Both under- and over-nutrition carry significant health implications (discussed later) and increase the risk of morbidities and mortality, thus costs. Hence, early detection and regular monitoring of patients' nutritional status is a necessity.

Methods of assessing body composition in population studies were recognised as possible means of assessing and monitoring nutritional statuses approximately 50 years ago, by Fletcher in 1962, and subsequently recommended for use within the clinical setting (Blackburn, 1977 cited in Bastow, 1982). Types of anthropometric measurements include weight and height, and as a result Body Mass Index (BMI) ( $\text{kg/m}^2$ ) can be calculated, as well as head circumference (cm) and supine length (cm) in infants – all of which are used to assess *body size*. *Body composition*, which can be further subdivided to measure the two major components of body mass (body fat and fat free mass), can be measured by using anthropometric measurements such as skinfold thickness, waist-to-hip ratio (WHR), waist circumference (WC), mid-upper arm circumference (MAC) and mid-upper arm muscle circumference (MUAMC) (Gibson, 2005).

When standardised methods (Lohman & Roche, 1988) and calibrated equipment are implemented measurements are often quick, easy and reliable (Gibson, 2005). Technological advancements allow the use of portable more scientific and accurate equipment. Anthropometry is said to be the single most portable, universally applicable, inexpensive and non-invasive method available to assess the proportions, size and composition of the human body (Gibson, 2005).

Although there is no universally accepted definition, malnutrition is literally interpreted as, and used synonymously with, 'bad nutrition'. The Malnutrition Advisory Group (MAG), a standing committee for the British Association for Parenteral and Enteral Nutrition (BAPEN), have suggested a definition of malnutrition as follows:

“A state of nutrition in which a deficiency, excess or imbalance of energy, protein, and other nutrients causes measurable adverse effects on tissue (shape, size, composition), function and clinical outcome” (BAPEN, 2003).

The adverse consequences of malnutrition are well documented, and are becoming increasingly publicised, perhaps linked to the now known associated costs of the condition. According to BAPEN (2008a) the costs associated with malnutrition, in the United Kingdom (UK), exceeded £13 billion in 2007. Whatever the cause of malnutrition, be it social, physical, psychological or medical, consequences of malnutrition can be severe (**table 1**).

**Table 1: Consequences of malnutrition (Thomas & Bishop, 2007)**

<b>General and specific consequences</b>	
Physical	Impaired immune function
	Increased susceptibility to infection
	Delayed wound healing
	Muscle wasting
	Reduced respiratory function – increasing susceptibility to chest infections
	Reduced cardiac function – increasing risk of heart failure
	Decreased muscle strength
	Reduced mobility – reducing independence and increasing risk of falls, thus fractures, bed sores and thromboembolism
	Small intestine structure altered – may affect absorption
	Increased post-operative complications
Psychological	Apathy – increasing low morale and general sense of weakness and illness affecting appetite further
	Depression
Societal	Increased visits to health care professionals
	Increased dependency on nursing care
	Increased length of stay
	Increased costs

Ultimately, prolonged and chronic malnutrition can be life threatening (National Institute for Health and Clinical Excellence [NICE], 2006). BAPEN's *Combating Malnutrition: Recommendations for Action* (2008a) report discussed the socioeconomic and health inequalities links with malnutrition. In the UK three million people are in a state of, or are at risk of, malnutrition. Approximately 93% of which are resident in the community. Previous research, and indeed media focus, seemed to highlight the malnourished population in hospital or acute environments. Although, as BAPEN (2008a) encourages, all settings must be vigilant towards malnutrition.

Nutritional screening is used to identify those at nutritional risk or in need of intervention. It can be applied on mass as it involves the use of simple and cheap measurements. These measurements are compared with predetermined cut-off points in order to categorize the patient's level of malnutrition risk; often categories such as low, medium or high risk are used (Gibson, 2005). Many nutritional screening tools exist, most of which include at least one anthropometric measure (see **table 2**). Validated nutrition screening tool use is encouraged by the National Patient Safety Agency (NPSA), the National Institute for Health and Clinical Excellence (NICE) and the Department of Health (DoH). However, according to BAPEN (2008b) hospitals, care homes and primary care settings are failing to screen all patients, with only 82% of hospitals (n = 130) having nutrition screening policies to comply with. Consequently, malnutrition remains under-detected and hence under-treated.

**Table 2: A brief list of nutritional screening tools and anthropometric measurements involved (from various sources)**

<b>Tool Name</b>	<b>Name abbreviation</b>	<b>Anthropometric measure involved</b>	<b>Group/Author</b>
Mini Nutrition Assessment	MNA	Weight BMI (or calf circumference)	Beck et al. (1999)
Malnutrition Universal Screening Tool	'MUST'	Height & weight, so to calculate BMI.  Surrogate measures such as demi-span, ulna length and mid-arm circumference can also be employed should height and weight be unobtainable.	BAPEN and MAG (2003)
Nutrition Risk Index	NRI	Weight (% weight loss)	Veterans Affairs Total Parenteral Nutrition Co-operative Study Group (1991)
Nutrition Risk Score	NRS	Weight (% weight loss over 3 months) BMI	Reilly et al. (1995)
Subjective Global Assessment	SGA	Weight (% weight change)	Detsky et al. (1987)
Prognostic Nutritional Index	PNI	Triceps skin fold	Buzby et al. (1980)
Registered Nurses Nutritional Risk Classification	-	Weight (weight loss and current weight as % of ideal)	Kovacevich et al. (1997)

BAPEN's key recommendations include the need for investment of organisations into equipment to enable timely weights and heights to be measured. It has been recognised that lack of accurate and suitable equipment is a potential barrier towards nutritional screening (BAPEN, 2008a) – thus one must consider whether there is a lack of equipment provision for dietitians to undertake appropriate anthropometric measurements and comprehensive nutritional assessments.



Morbidity and mortality risks are also increased with over-nutrition (i.e. being overweight or obese). Significant health implications such as: arthritis, increased risk of cancers, cardio-vascular disease (including hypertension, heart disease and stroke), and diabetes are among the most common chronic conditions reported among older obese and overweight adults, as well as an increased risk of physical and cognitive disability (Houston, Nicklas & Zizza, 2009). It is clear, therefore, that not only under- but over-nutrition must be correctly and timely identified and thus treated. Screening tools such as 'MUST' emphasize their ability to recognise both anomalies to a healthy weight (BAPEN, 2003).

Once those who are at nutritional risk have been identified interventions may be put into place. Anthropometry can then be used as a set of objective measurements to monitor patients' progress and/or the effectiveness of the intervention (Gibson, 2005).

Guidelines for anthropometric use within various populations and settings have been produced. WHO (1995) describe the use of anthropometric measurements in reflecting population-level health, social and economic status as well as use throughout the life cycle in terms of individual assessment. Similarly, NICE (2006) recommend the use and frequency of use of anthropometric measures such as weight, BMI, mid-arm circumference and triceps skinfold thickness when monitoring patients requiring nutritional support. NICE further recommends the use of BMI and WC measurements when assessing overweight patients (i.e. those patients classified as having a BMI  $<35\text{kg/m}^2$ ).

A wealth of research considers how anthropometry can be used to assess not only nutritional but also health status, i.e. various medical conditions and/or one's risk of these conditions. A brief overview of various anthropometric tools and their use for detecting or monitoring numerous health conditions is detailed below, although to consider this topic area in greater detail is beyond the scope of this project.

#### 1.1.1. BMI

Body Mass Index (BMI) indicates body weight in relation to height, calculated as the ratio of weight in kilograms divided by height in meters squared [ $\text{kg/m}^2$ ] (Gibson, 2005).

Many screening tools use BMI as a criterion for identifying malnutrition – typically under nutrition. Despite this, BMI is deemed to not have high sensitivity, and thought not to always detect central obesity, which is often taken as an indicator for chronic disease risks (Chakraborty & Chakraborty, 2007). Also BMI may fail to detect small yet clinically significant weight changes, i.e. a patient's BMI may be within a 'healthy' range but the weight loss may be of a clinically significant amount thus increasing the risk of mortality (Cook et al., 2005). It has been recommended to interpret BMI with caution as it does not directly measure adiposity but the body as a whole, and clinical judgement should be used when applying BMI to certain subgroups; for example, those with greater than average muscle mass (athletes/body builders), those <18 years or >65 years of age and those with fluid disturbances (dehydrations/ascites) to name a few (NICE, 2006; Thomas & Bishop, 2007). Despite this, BMI is thought to be widely used in clinical, practical and community areas of work because of its practicality and ease of use (Akpınar et al., 2007).

BMI used to detect overweight or obesity is regularly associated with cardiovascular disease (CVD) risk (Visscher et al., 2001; Paniagua et al., 2008), including ischaemic heart disease (Chen et al., 2006) as well as type 2 diabetes development risk (NICE, 2006). A large (n = ~20,000) prospective cohort study with a 10 year follow-up indicated that fatal and non-fatal CVD risk is greater for those identified as overweight or obese (Dis et al., 2009). Self-reporting, self-measuring and under reporting are typical errors with such studies, however, Dis and colleagues used measured weights and heights to accurately calculate BMI and WC scores and found that for young to middle aged (20-65 years) Dutch adults CVD risk could be correctly or reasonably well predicted by this method.

#### 1.1.2. WC and WHR

Waist circumference (WC) is a simple measure of the circumference around the waist between the lowest rib and the iliac crest. The ratio between the circumferences of the waist and hips represents the waist-to-hip ratio (WHR) (WHO, 1995; Thomas & Bishop, 2007).

Numerous studies have reported that WC measurements are similar if not more accurate at predicting mortality risk (Visscher et al., 2001), CVD risk (Lean & Han, 2002; Zhu et al., 2002; Zhu et al., 2005) and health outcomes (Woo et al., 2002) compared with BMI. Ross et al. (2008) considered the practicalities of measuring WC. Despite WC appearing to be widely recommended for practical and clinical use as a relatively easy concept it was suggested that no gold standard protocol for measuring WC yet exists. Studies are therefore using a range of protocols that are derived from numerous forms of guidance including National Institutes of Health (NIH): *The Practical Guide to the Identification, Evaluation and Treatment of Overweight and Obesity in Adults* (2000), and WHO (1995): *Physical Status. The Use and Interpretation of Anthropometry*. Experts in obesity assessment,

management and epidemiology research from the University of Laval, Canada, reviewed 120 studies and found that the association between WC and CVD/diabetes morbidities, all cause or CVD mortalities are not influenced significantly by site or technique of WC measurement. WC implementation, regardless of measurements site, was recommended, with the NIH protocol suggested as being more practical and easier to use due to descriptions involving bony landmarks (Ross et al., 2008). Such findings should be reflected upon when considering practical barriers to anthropometric use amongst dietitians. It may be logical to consider that lack of confidence and/or knowledge of guidance, or confusion over recommended protocols may deter anthropometric use.

Conflicting evidence exists for the use of WHR. Woo et al. (2002) describe WHR as an un-useful predictor of health outcomes; whereas Price et al. (2006) recently described how a high WHR is associated, more closely than BMI and especially WC, with a greater mortality risk in the elderly. This is similarly described by Seidell et al. (2001) who considered that waist and hip circumferences measure different aspects and compositions of the body yet the independent effect of these measurements may not be as strong when provided as a ratio.

### 1.1.3. Research gap

Despite the volume of research in the area of anthropometry including advantages, disadvantages, comparisons of the individual measurements and recommendations to use anthropometry by health organisations, there is very limited research on current or practical use of anthropometry. When assessing nutritional status Baxter (1999) detailed the need for anthropometric and biochemical data to be considered and advocated the role of dietitians. She proposed *potential* limitations to taking measurements in the clinical setting. A recent reflection of Australian nurses' use and thoughts of nutritional screening highlighted barriers and negative attitudes,

primarily towards its documentation, yet could not detail dietitians' views (Porter et al., 2009). Similarly, a study, limited in sample size (n = 25) thus generalisability, did consider nursing and medical staff's knowledge and use of anthropometry within children wards in one hospital in Glasgow. This, however, included just two dietitians and the documentation of weight, height and percentiles only (Bunting & Weaver, 1997).

Thus, literature searches failed to find substantive research investigating the attitudes of clinicians', or people taking the measurements, towards anthropometry and specifically of dietitians. There also appears to be very limited published data that consider the frequency and the practicality of use of anthropometric measurements, i.e. enablers and barriers of implementation. An additional problem encountered was the lack of validated methods used to evaluate attitudes and beliefs towards the use of clinical measurements including anthropometry. This is discussed in the following section.

#### *1.1.3.1. Attitudinal scales*

An attitude may be thought of as a complex mental state involving beliefs, feelings, values and dispositions to act in certain ways (Cambridge Advanced Learner's Dictionary, 2008). One specific attitude that is likely to directly affect behaviour (i.e. whether anthropometric measurements are taken or not) is that of confidence. Confidence may be defined as "the quality of being certain of your abilities or of having trust in people, plans, or the future" (Cambridge Advanced Learner's Dictionary, 2008).

In order to quantitatively assess subjective feelings or attitudes such information must be translated into quantitative data using 'psychometric' or scale-based methods. Early examples of such methods originate from pain, pleasure, taste, effect of drugs/medication research (Freyd, 1923; Ohnhaus & Alder, 1975; Downies et al., 1978; Rogers & Blundell, 1979). Freyd (1923) reported the need to assess the practical and statistical validity of scales in order to validate their use. Validity refers to how repeatable the measure is, the spread and normality of the data and how it compares to other measures. Practical validity considers the ease of use and interpretation.

Categorical scales often involve tick-boxes, numbers or ordering/ranking of variables, on which the subject is asked to indicate one option in response to a question. Examples include the nine-point hedonic scale (Peryam & Pilgrim, 1957) and the Likert scale. The latter was originally developed to measure attitudes (Likert, 1932 cited in Bartoshuk, et al., 2004) and has long been used in areas of psychology and sports psychology (Taylor & Wilson, 2005). However, there appears to be no validation studies for their use in testing confidence when taking measurements – or anthropometry specifically - as apposed to performing gross motor skills, tasks or activities.

The psychometric measure known as Visual Analogue Scale (VAS) was originally used to study pain (Ohnhaus & Alder, 1975). A VAS typically consists of a 100mm or 150mm horizontal linear scale (in paper or now electronic version) with anchoring labels at each end indicating the extremes of the issue/topic involved. The subject marks a vertical line/trait across the horizontal line to indicate their feeling to the variable in question, which is measured in millimetres from the left hand anchor, hence quantifying feelings. These scales are easy to interpret, with low burden on the subject and thought to be able to be transferred to numerous experimental

conditions with low variability (Stubbs et al., 2000). These scales have been validated for the measurement of pain and appetite dimensions (Flint et al., 2000; Whybrow et al., 2006; Almiron-Roig et al., 2009). The VAS is an example of an unlabelled continuous linear scale, but linear scales can also be labelled with descriptors placed at intervals indicating gradation of feelings. The Labelled Magnitude Scale (LMS) is a labelled linear scale and was developed by Green, Shaffer and Gilmore (1993). LMS often include a 'maximal' or 'strongest imaginable' label at the most right or vertical anchor. The effect of such statement on scale validity is debated (Bartoshuk et al., 2004; Cardello et al., 2005).

VAS have the advantage over other Likert/categorical and labelled scales of not assuming that each responder perceives interval gaps as equal size, distance or weighting. Similarly, by not having several labels along the scale (numerical/word markings) the responder is not prompted or influenced as to where to place their mark. Although LMS or continuous scales allow greater responder choice, than Likert or categorical scales, they are thought to be less sensitive than non-labelled tools due to the labels and feeling magnitudes not directly relating to each other. This issue was further considered by Bartoshuk et al. (2004) who created and validated an extended form of the Labelled Magnitude Scale – the General Label Magnitude Scale (gLMS). The vertical rule was extended to 230mm, labels were adapted to not directly relate to the sensation involved and included the maximum label of “strongest imaginable sensation of any kind” allowing for responders sensations to be moderated or normalised, facilitating group comparison.

There appears, however, to be no validated tool to assess attitudes and feelings, in a quantitative manner, when using anthropometric measurements; hence this project also considered validation of a scale for anthropometry related attitude assessment use.

## **1.2. Aims and objectives**

There are many anthropometric measurements and screening tools available, yet no specific research has been found that investigates the practicalities of using such tools neither on various patient groups nor in different dietetic working groups. It is therefore thought that value will be gained by exploring the use of anthropometric measurements, which tools are most commonly used and potential reasons of why such objective measures may not be taken in the practical setting. It is possible to consider that due to differences in work settings and patient groups seen, there may be differences in working practice between community and acute (hospital) based dietitians. This study will consider acute and community working dietitians as two separate groups.

The aim of this study is to investigate the use of and barriers and attitudes towards using anthropometric measurements by NHS working dietitians in the North West of England, using validated attitudinal scales.

It is hoped that this research will provide an evidence base for the re-evaluation of anthropometry recommendations, use and training within the NHS to improve consistency and accuracy of nutritional assessments. In addition, it is expected that a sensitive and reliable tool for assessing confidence at taking anthropometric measurements amongst dietitians will be developed, for use within future research or within other area topics.



### **1.3. Hypotheses**

The primary alternative hypotheses (H1) under study for this work are:

There will be a significant difference in:

(a) the type or frequency of use,

(b) the attitudes towards,

and (c) the barriers towards anthropometric measurement use between community and acute working dietitians.

Secondary to this, it is suggested the present study may allow exploration into whether there are differences in the type, frequency of use and attitudes/barriers towards anthropometric measurements within sub-groups of dietitians (i.e. acute vs. community weight management or renal specialist dietitians etc.). It is predicted that a sufficient number of dietitians will not be available from the targeted population by area of work or numerous variables thus this part of the study will be explorative rather than hypotheses testing.

## 2. METHODS

### 2.1. Study design

This was an exploratory, cross-sectional study, based on a mailed survey.

#### 2.1.1. Design and validation of the questionnaire

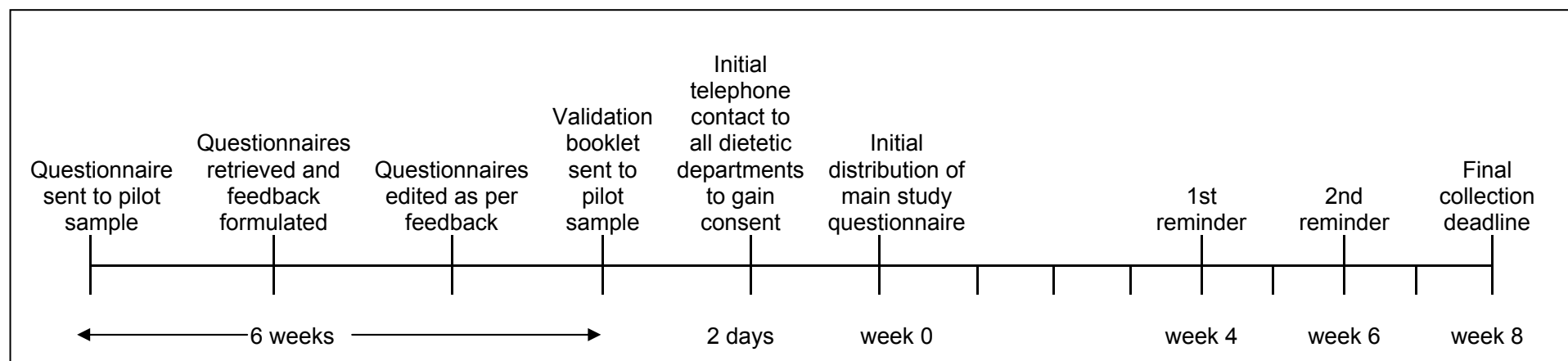
The questionnaire was constructed considering various areas of dietetics and array of anthropometric tools (see **appendix 1**). Questions explored anthropometric measurement and screening tool use in practice (questions 2 and 4), the frequency of use of various anthropometric measures (question 4), potential barriers (questions 3, 5 and 7) and attitudes towards using anthropometric measurements (questions 6 and 8). Question 1 was included to ensure that two groups could be determined to allow for comparison of answers (i.e. acute vs. community). By including four answers the participants who work across both community and acute settings were not excluded from the study. Questions 9 - 13 inclusive allowed description of the sample to be formed.

**Figure 1** depicts the time frame and outline of the study. The questionnaire was piloted using a convenience sample of acute and community working dietitians. The pilot questionnaire (see **appendix 1**) was completed by acute and community practicing dietitians based at Salford Royal NHS Foundation Trust and Salford PCT (see **appendix 2** for letter of consent) and other dietitians known to the author. Dietitian volunteers from a department outside of the North West (University Hospital of North Staffordshire) were also recruited for the piloting. Biasing was reduced by ensuring a wide range of bands/post levels for both acute and community responders from several departments, which were thought to be similar in characteristics hence comparable to the main trial population.

Pilot volunteers were asked to complete the thirteen question survey, followed by eight pilot feedback-questions relating to the format and layout plus provided opportunity for other suggestions or comments to be made regarding the questionnaire. A further series of questions, which considered their confidence on using various anthropometric measurements followed. For this section each question was repeated three times, each time utilising a different scale: a Visual Analogue Scale [VAS] (Ohnhaus & Alder, 1975), a Likert scale (Likert, 1932) and a General Labelled Magnitude Scale [gLMS] (Bartoshuk et al., 2004). The VAS and gLMS used the original research labels and adapted to relate to confidence (i.e. 'not at all...confident') and the Likert scale was adapted to include the primary question of 'I lack tools/knowledge to effectively measure/calculate my patient's...'. This phrase was adapted from Bush, Cherkin and Barlow (1993) questionnaire, who considered practitioner's self-confidence and attitudes towards treating patients with lower back pain. It was thought relevant to take the first Likert question from this tool as literature searches failed to find other papers that attempted to assess Health Professional's confidence/attitudes using Likert scales.

The pilot study participants were asked to re-answer the latter set of questions (validation booklet) six weeks later to validate the use of VAS, gLMS and Likert scales for assessing confidence when taking anthropometric measurements. The order in which the scales were distributed within the validation booklet (see **appendix 1**) was randomised using random number generator tables.

Adaptations and editions to the thirteen-question survey took place as indicated following pilot study participant's feedback (see **appendix 1** for pilot study questionnaire which includes feedback questions).



**Figure 1: Study design time line**

## 2.2. Population and sample

All NHS working dietitians and dietetic assistants (n = 515) across the North West region were targeted (see **appendix 3** for a comprehensive list of all NHS and Primary care trusts (PCT) in the North West). Both Primary and Acute trusts were targeted to ensure that a mix of community and hospital based ('acute') dietitians, and dietetic assistants, responded to the questionnaire. **Table 2** highlights the trusts where dietetic departments consented to accept the postal questionnaire. Any dietitian registered with the Health Professions Council (HPC), or dietetic assistant, who is employed by the NHS, working within any area of dietetics and contracted for any number of hours was able to complete the survey. Please note that the terms responders/ participants/ dietitians will be used interchangeably throughout this report. It is acknowledged that responders may also include assistants or non-registered dietitians.

Exclusion criteria consisted of:

- Any registered dietitian or assistant who is not employed by the NHS.
- Any registered dietitian or assistant employed by the NHS, working outside of the North West area of the UK.

Those departments that declined the acceptance of the questionnaire or failed to respond to messages and emails, or trusts/centres that do not have access to dietitians were also excluded from the study.

A recent unpublished MSc thesis (Whyand, 2007) conducted a survey to investigate NHS dietitians' knowledge and confidence of promoting physical activity to patients. Between 500 and 800 questionnaires were distributed across the UK. A 24% response rate was achieved, which is within other published response rates of 21-27% when using dietitians as the sample (McKenna et al., 2004). Similarly, a power analysis typically suggests the need to achieve 20-30 responses per group for a sufficient sample within questionnaire research (Burgess, 2003). It was therefore estimated, that within the present study, at least 300 questionnaires would need to be distributed to achieve similar and acceptable response rates. However, this study was confined to the North West of England, therefore the number of dietitians available was fixed. Data sources revealed that in 2007 five hundred and fifteen dietitian therapists (excluding managers) were employed by the NHS in the North West area of England (The Health and Social Care Information Centre, 2010). It was, therefore, predicted that if all dietetic departments were contacted within the North West region, a response rate of greater than or equal to 30% could be achieved (i.e. 150 responses) and that findings could be representative of the practices and attitudes of dietitians working in the North West of the England. Future research would then be indicated to consider dietitians at a national level across the UK.

**Table 3: Names of Trust and number of questionnaires posted per department**

<b>Name of Trust</b>	<b>No of questionnaires requested/posted</b>
Knowsley PCT	35
East Lancashire Hospitals NHS Trust: Royal Blackburn Hospital	30
The Mid/East Cheshire NHS Trust: Leighton Hospital	30
Aintree University Hospitals NHS Foundation Trust: University Hospital Aintree	23
Manchester PCT	23
Central Lancashire PCT	20
University Hospitals of Morecambe Bay NHS Trust: Westmorland General Hospital	20
Salford NHS: PCT and Salford Royal NHS Foundation Trust	19
Wirral Hospital NHS Trust: Arrowe Park Hospital	17
East Lancashire PCT	15
Royal Liverpool and Broadgreen University Hospitals NHS Trust: Royal Liverpool University Hospital	15
University Hospital of South Manchester NHS Foundation Trust: Wythenshawe Hospital	15
Blackpool, Fylde and Wyre Hospital NHS Trust: Victoria Hospital	14
Heywood, Middleton, Oldham and Rochdale PCT	14
Royal Liverpool Children's NHS Trust: Alder Hey Hospital	13
St Helen's and Knowsley Hospitals NHS Trust: Whiston Hospital	10
Bolton Hospitals NHS Trust: The Royal Bolton Hospital	9
Cumbria PCT	9
Christie Hospital NHS Trust	8
Royal Manchester Children's University Hospitals NHS Trust	8
Stockport NHS Foundation Trust: Stepping Hill Hospital	7
Halton and St Helens PCT	6
North Lancashire PCT: St Anne's	5
Southport and Ormskirk Hospitals NHS Trust	5
Stockport PCT	5
Tameside and Glossop PCT	5
Wrighton, Wigan and Leigh NHS Trust: The Elms, Royal Albert Edward Infirmary	5
Ashton Leigh and Wigan PCT	4
North Cumbria Acute Hospitals NHS Trust: West Cumberland Hospital	4
Liverpool Women's NHS Foundation Trust: Liverpool Women's Hospital	2
Tameside and Glossop Acute Services NHS Trust: Tameside General Hospital	2
<b>Totals: 31 bases</b>	<b>397</b>

### **2.3. Procedures: Questionnaire administration**

All NHS and PCT trusts across the North West of England were contacted via telephone or e-mail over a two consecutive day period in February 2010. A telephone script or standard e-mail was used (see **appendix 3**) to ensure standardised information was provided to each department. The telephone or e-mail contact enabled the survey to be introduced and for department's preferred mode of future contact to be noted, i.e. e-mail or telephone, for future reminder contacts.

All consenting departments were provided with the number of questionnaires requested (i.e. 1 per dietitian or individually consenting dietitian/assistant) via the post, along with a self-addressed freepost envelope.

The cover letter and participant information sheet, included with each questionnaire, clearly stated the final submission date and details about the study, including their right to withdraw at any time and the anonymity of answers (see **appendix 1**).

The first of 2 follow-ups (phone calls or e-mail contact) took place four weeks following the first dispatch of questionnaires; at this time an electronic form of the questionnaire was also offered to the department should additional questionnaires be needed (electronic questionnaires were encouraged to be printed out and returned to the researcher via post). Two weeks after this (i.e. 6 weeks post dispatch of the original questionnaires) the second and final reminder took place, requesting questionnaires to be completed and returned, emphasising the final submission and acceptance date (see **figure 1**).



It is acknowledged that the time demand on pilot participants was greater than for those completing the main questionnaire as the piloting took place over two separate time periods. The amount of time required to complete the main questionnaire was highlighted on the cover letter and determined from the pilot sample feedback answers (i.e. they were asked to record the duration taken to complete the main questionnaire). The number of questions included in both the pilot and main questionnaires were minimised and most required tick box answers only to reduce participant burden (Smeeth & Fletcher, 2002).

Participants were encouraged to self-select their designation when completing the questionnaire, to determine if they were community- or acute- based dietitians, and asked to answer the whole questionnaire in relation to this designation. When referring to community work, or being a community dietitian, this indicates that the individual's work time is predominantly not based within a hospital (i.e. not determined by sector of employment e.g. PCT or NHS but by the area in which they work). This supports the definition provided within the *Role Paper of the Dietitians of Canada, Community Dietitians in Health Centres Network* (2004):

“Community Dietitians are Registered Dietitians. Distinct from Public Health Dietitians/Nutritionists, Community Dietitians work in a variety of settings such as Community Health Centres, resource centres, social service agencies and recreation centres”.

Conversely when referring to acute dietitians or acute working this regards the care of patients based within a hospital to be treated for acute illnesses.

Consent was deemed to have been gained by the participant completing and submitting a questionnaire. At the end of the questionnaire each participant was notified that their involvement in the present study was complete and they were thanked for their time.

## 2.4. Data management and statistical analysis

Once the final submission date was reached the returned questionnaires were analysed using Statistical Package for the Social Sciences software (SPSS UK Ltd 1999, V17.0 (PC)).

Data was explored using the Descriptive statistics option of SPSS. To test the association between area of work (acute/community) and trust screening tool (Question 2), the type/frequency of anthropometric measurement (Question 4), barriers (Questions 3, 5 and 7) and attitudes (Questions 6 and 8) towards anthropometry, Chi-squared ( $\chi^2$ ) tests were used. Differences in perceived confidence levels for different measurements between acute and community dietitians were analysed with t-tests for independent samples (Question 3), tested via VAS.

Please note that for Question 6, attitude assessment, the 5 point Likert scale questions were screened and negatively worded items (i.e. sub-questions d, e, f, i, j, k, l, m, and n, please see **appendix 1**) were reversed to ensure continuity of rating across all questions; i.e. the lower the score the more positive the attitude towards the question. Total attitude was considered for the study sample overall and for acute and community groups only (i.e. responders could choose 1-5 ['strongly agree' — 'strongly disagree' respectively] on the 5 point Likert scale for each of the 15 sub-questions thus, overall, the scale range was 15-75). This was necessary as the minimal cell frequency assumption ( $\geq 5$ ) was violated when considering Chi-squared tests for the individual attitude questions (Pallant, 2007).

Validation of the VAS and gLMS scales as measures of confidence when taking anthropometric measurements was performed by measuring the sensitivity and reproducibility of the VAS and gLMS in comparison to the Likert scale that is more commonly used. For this, the Likert categorical data were converted to continuous data and all scales results were calibrated to a 100 point scale to allow comparison (i.e. the 230mm gLMS scale results were divided by 2.3; Likert responses were transformed to a 0-4 point scale and each answer multiplied by 25 thus all scale responses were comparable to a 100-point scale). Analysis of variance (ANOVA) with post hoc tests were used to assess sensitivity of VAS and gLMS against Likert scales. Bland-Altman Plots and standard deviations were used to assess reproducibility and confirm comparison amongst scales (Bland & Altman, 1986; Flint et al., 2000; Bartoshuk et al., 2004; Whybrow et al., 2006).

The level of significance, alpha ( $\alpha$ ), for all statistical tests was set to  $p < 0.05$ .

## **2.5. Ethical and cost implications**

The study protocol was reviewed by the National Health Service (NHS) National Research Ethics Service (NRES) and Integrated Research Application System (IRAS) who deemed it to be a service evaluation/audit (**appendix 2**). Ethical approval was applied for and granted by the University of Chester Research Ethics Committee (see **appendix 2**).

The questionnaires were only provided in typed English documentation as all dietitians working for the NHS must be registered with the Health Professions Council (HPC), who request a minimal level of communication in the English language (HPC, 2008). As the targeted sample were registered dietitians and dietetic assistants in the North West no level of discrimination is likely to have arisen from this research project.

The potential for discomfort, distress, inconvenience or changes in lifestyle for participants was limited (Department of Health, 2003). Subjects were asked to self-complete the questionnaire within an eight week time frame and self-addressed, freepost envelopes were also included to minimise cost and burden to participants. Despite this, it is recognised that time and case load demands on dietitians are high and the questionnaire would have inevitably required a level of time and commitment from each participant. Follow-up reminders may also have induced a small level of demand on the department. However, as the questionnaire was designed to be as quick and as simple to complete as possible and the option of consent and withdrawal made clear to the participants it is hoped that any distress was lessened. This study did not involve patients/clients and anonymity of questionnaire responses was upheld.

No monetary or financial reward was offered via this research project decreasing bias (Smeeth & Fletcher, 2002). There were no other relevant ethical issues involved for this study.

No bursary, thus no conflict of interest, has been incurred by the researcher.

The present project had relatively low cost implications. Costs included printing of the questionnaires, envelopes and postage to the departments as a batch, and one additional self-addressed pre-paid envelope per questionnaire sent for their return to the researcher and cost of telephone contact to each department. Costs have been subsidised utilising University of Chester's post-graduate studies fund only.

### **3. RESULTS**

#### **3.1. Pilot study**

The questionnaire was piloted on a convince sample of 32. Dietitians employed at Salford Royal, Salford PCT and University Hospital of North Staffordshire were targeted. Twenty three (72%) reported working in/mainly in the acute setting and 9 (28%) reported working in/mainly in the community setting. All but 1 responder (n = 1, 3%) was female. Two responders (6%) reported working part-time, 30 (94%) work full time hours. Experience ranged from <1 – over 20 years.

Feedback suggested that the average time to complete the questionnaire was 10 minutes (5 - 20 minutes). 100% of responders found the length, layout and font of the questionnaire as acceptable and understandable. The main study questionnaire was amended as follows: More anthropometric measurements were included in the questions considering confidence (question 3) and frequency of use (question 4); more options were included as reasons for not using anthropometry (question 5) as well as additions to the attitude questions (question 6) as a result of pilot feedback.

### 3.2. Validation study: Scales to assess confidence

#### 3.2.1. Sensitivity

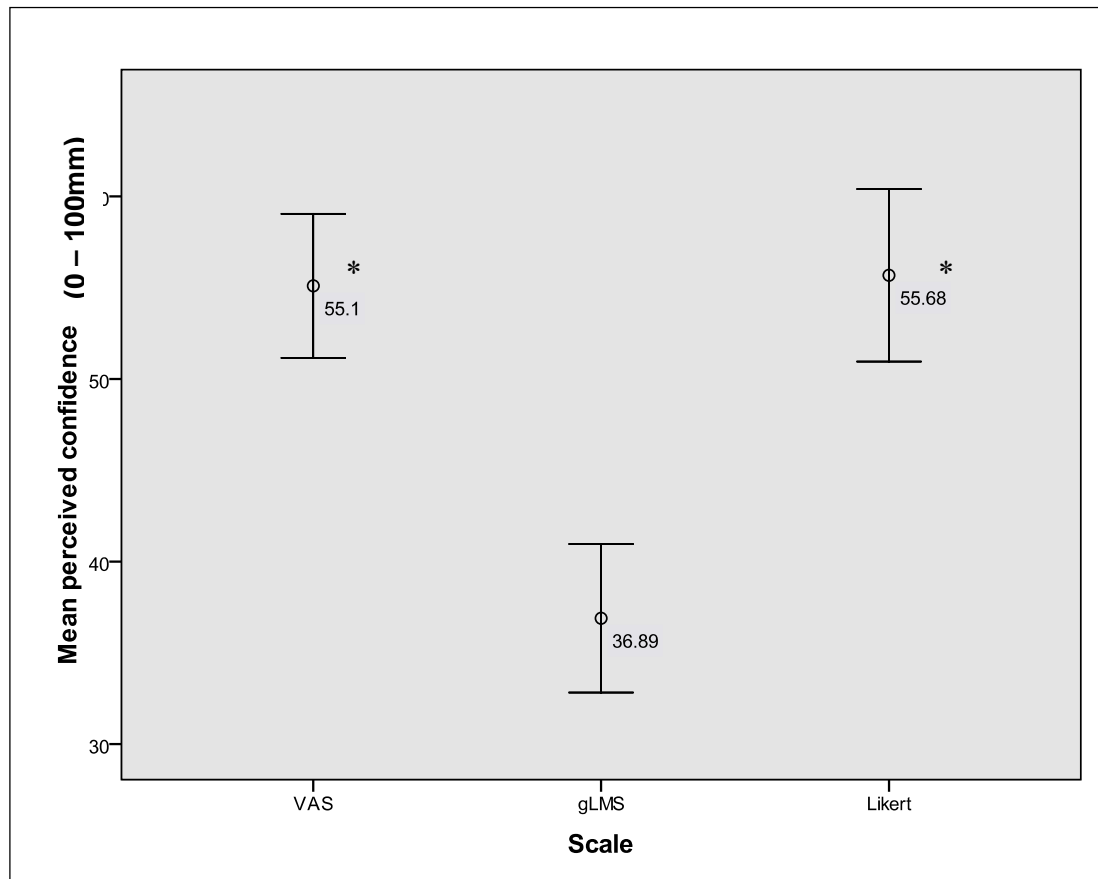
A one-way between-groups Analysis of Variance (ANOVA) with post-hoc tests were conducted to compare *average* confidence when taking various anthropometric measures (see validation questionnaire, **appendix 1**) using three forms of confidence scales: VAS, gLMS and Likert by the pilot sample (n = 32).

The homogeneity of variance assumption was not violated ( $p > 0.05$ ).

There was a significant difference in confidence ratings amongst the three scales,  $F_{(2, 149)} = 24.97$  ( $p < 0.0001$ ). Post-hoc comparisons using the Tukey HSD test indicated that the mean score for confidence using the gLMS scale was significantly different from the mean score for confidence using Likert and VAS scales. Mean (SEM) confidence scores were: for gLMS 36.9mm (2.54mm), for Likert 55.7 (2.98) and for VAS 55.1mm (2.49mm) (**figure 2**).

Therefore the VAS was equally sensitive as the Likert, but the gLMS were able to detect lower scores.





\* Differs significantly from gLMS ( $p < 0.05$ ).

**Figure 2: Means ( $\pm 2$  SEM) for VAS, Likert and gLMS scales used to assess perceived confidence at taking all anthropometric measurements ( $n = 32$ )**

### 3.2.1.1. Measures of agreement

Bland-Altman tests (Bland & Altman, 1986) were conducted to assess the reproducibility of the Likert, VAS and gLMS scales when assessing confidence at taking anthropometric measurements in a test re-test experiment.

Any two methods that are designed to measure the same parameter should have a good correlation. However, a high correlation does not automatically imply that there is good agreement between the two methods. Bland-Altman plots can be used to compare a new measurement technique or method with a gold standard (Glantz, 2005). In the present study's case comparing VAS and gLMS to the well referenced and used Likert scale (as our gold standard).

Bland-Altman method also allows for mean of the differences between the two scales to be calculated. This, known as confidence limits, provides insight into how much random variation may be influencing the results. If the two scales that are being compared tend to agree, the mean will be near zero. If one scale is consistently higher, or lower, than the other, the mean will be far from zero, but the confidence interval will be narrow. If the scales tend to disagree, but without a consistent pattern, the mean will be near zero but the confidence interval will be wide. This is illustrated visually using the Bland-Altman plots. These graphs plot the mean difference, and the confidence limits on the vertical against the average of the two ratings on the horizontal; demonstrating not only the overall degree of agreement, but also whether the agreement is related to the underlying value of the item. For instance, two scales might agree closely when confidence ratings are low, but disagree on high confidence ratings (Glantz, 2005).

Responders were requested to indicate their level of confidence for 12 anthropometric measurements. Each responder answered these 12 'confidence questions' three times, once using the VAS, once using the gLMS and once with Likert. At a later stage, each responder indicated their confidence level for the same 12 anthropometric measurements, again repeated three times so to use VAS, gLMS and Likert scales, i.e. a test re-test experiment. Histograms illustrated that the mean differences were normally distributed, i.e. the fewer number of points outside the 2 standard deviation (SD) limit indicates higher level of agreement between the two scales. Hence, justifying the use of Bland-Altman plots and measures of agreement calculations (**figures 3 and 4**).

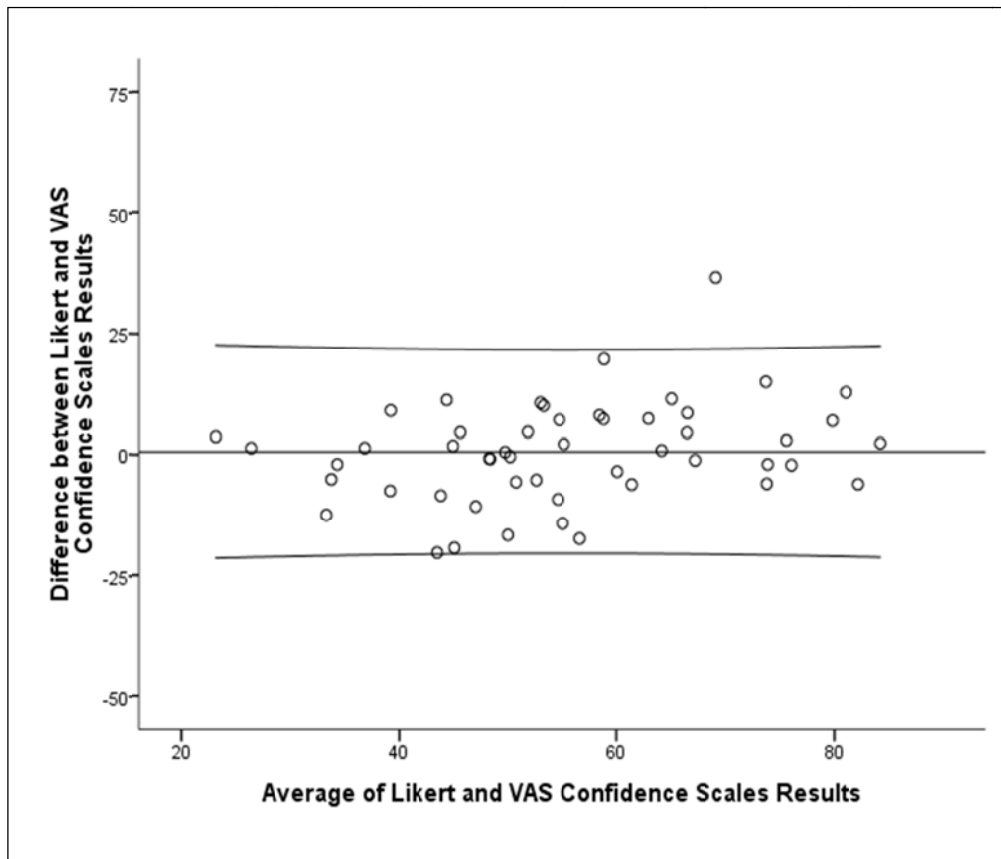
An average for each of the anthropometric measurements was calculated (i.e. all responder's answers for confidence when taking a patient's height for test 1 and 2 when using VAS were added together and divided by total number of responses to reach an "average confidence score for height measurements using VAS"). This was repeated for all 12 anthropometric measurements and then repeated for all three scales.

The *difference* between these average confidence results for each anthropometric measure was calculated to indicate the disagreement between two scales used (i.e. average confidence for height using Likert minus average confidence for height using VAS). The mean and standard deviation (SD) of *these differences* in average confidence were calculated to indicate the bias and variation between two scales/tools used, i.e. mean and SD for differences between Likert and VAS, and then for Likert and gLMS. Results showed that the Likert and VAS scales were the most comparable (mean difference 0.58), as the closer the mean difference is to zero the better the two methods compare (Pallant, 2007) all other comparisons were >1 (**table 4**). The 'average confidence scores' for each of the anthropometric measurement questioned were combined to get a '*total* average confidence score' for each scale (Likert, VAS and gLMS), thus allowing for an average of Likert and VAS, then for Likert and gLMS confidence scores to be computed (**table 4**). These results are considered to be the best estimate of the true value of confidence being measured.

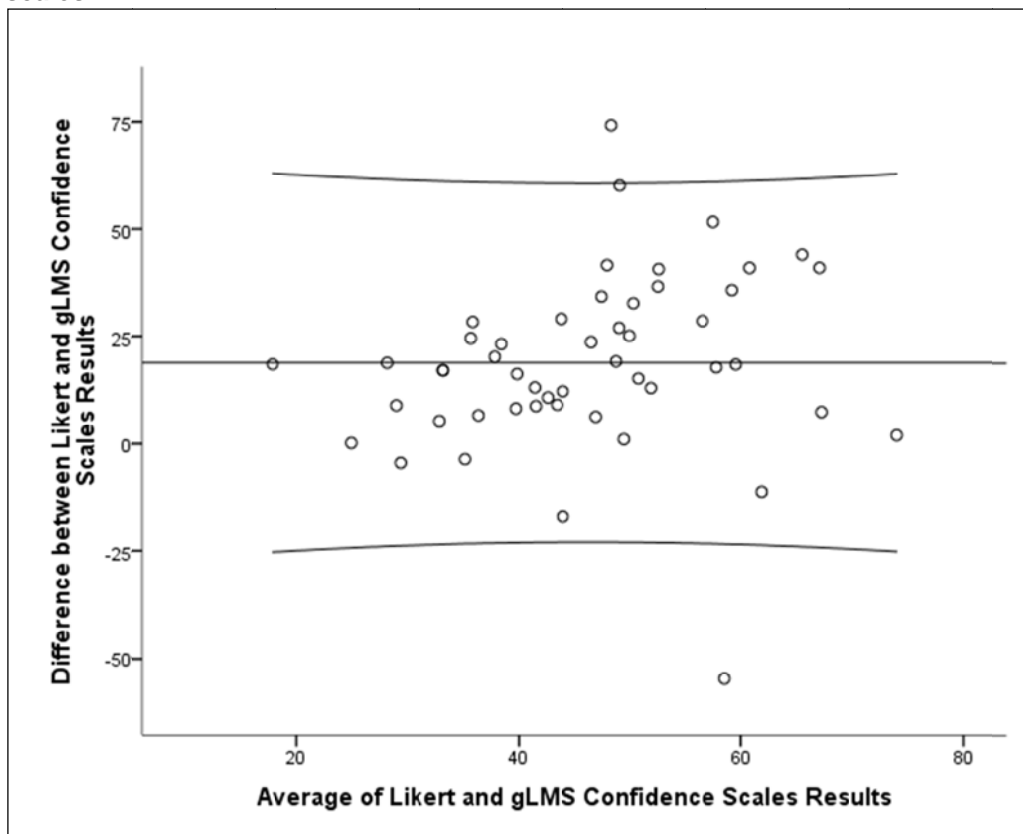
The difference between Likert and VAS scores were plotted against the average of Likert and VAS scores to form Bland-Altman plots, indicating any systematic differences between the scales used when assessing confidence. This was repeated for Likert and gLMS results (**figure 3 and 4**).

**Table 4: Mean differences and averages of confidence scores for VAS, Likert and gLMS scales used to assess perceived confidence at taking anthropometric measurements (n = 32)**

	Difference between Likert and VAS confidence scales results	Difference between Likert and gLMS confidence scales results	Average of Likert and VAS confidence scales results	Average of Likert and gLMS confidence scales results
Mean	<b>0.58</b>	18.82	55.39	46.3
Median	0.83	18.05	54.63	47.2
Std. Deviation	10.389	20.601	14.648	11.932
Minimum	-20	-55	23	18
Maximum	37	74	84	74



**Figure 3: Mean differences against average confidence, measured with Likert and VAS scales**



**Figure 4: Mean differences against average confidence, measured with Likert and gLMS scales**

The limits of agreement calculations were as follows:

Likert – VAS:

Lower: Mean difference – (2 x SD of difference) = 0.58 – (2 x 10.389) = **-20.2**

Upper: Mean difference + (2 x SD of difference) = 0.58 + (2 x 10.389) = **21.4**

Coefficient of reproducibility (CF) = 100 x SD of difference / Mean =

(100 x 10.389)/55.39 = **18.8%**

Likert – gLMS:

Lower: Mean difference – (2 x SD of difference) = 18.82 – (2 x 20.601) = **-22.4**

Upper: Mean difference + (2 x SD of difference) = 18.82 + (2 x 20.601) = **60.0**

Coefficient of reproducibility (CF) = 100 x SD of difference / Mean =

(100 x 20.601)/46.30 = **44.5%**

The lower CF result demonstrates a greater level of reproducibility between Likert and VAS than between Likert and gLMS. This confirms the similarity of Likert vs. VAS.

### 3.2.2. Reproducibility

As the pilot sample participants were asked to complete the sets of scales on two separate occasions it has been possible to complete repeatability tests for VAS, gLMS and Likert as scales to measure confidence when taking anthropometric measurements (Bland & Altman, 1986). **Figures 5-7** demonstrate that 95% of difference scores are less than 2 standard deviations (SD) from the means, which falls within the definition of repeatability coefficient in line with the British Standards Institution (British Standards Institution, 1975 cited in Bland & Altman, 1986). The smaller the SD the more agreement between the two repeated tests, this happened equally for all three scales measured, indicating each scale is reliable.

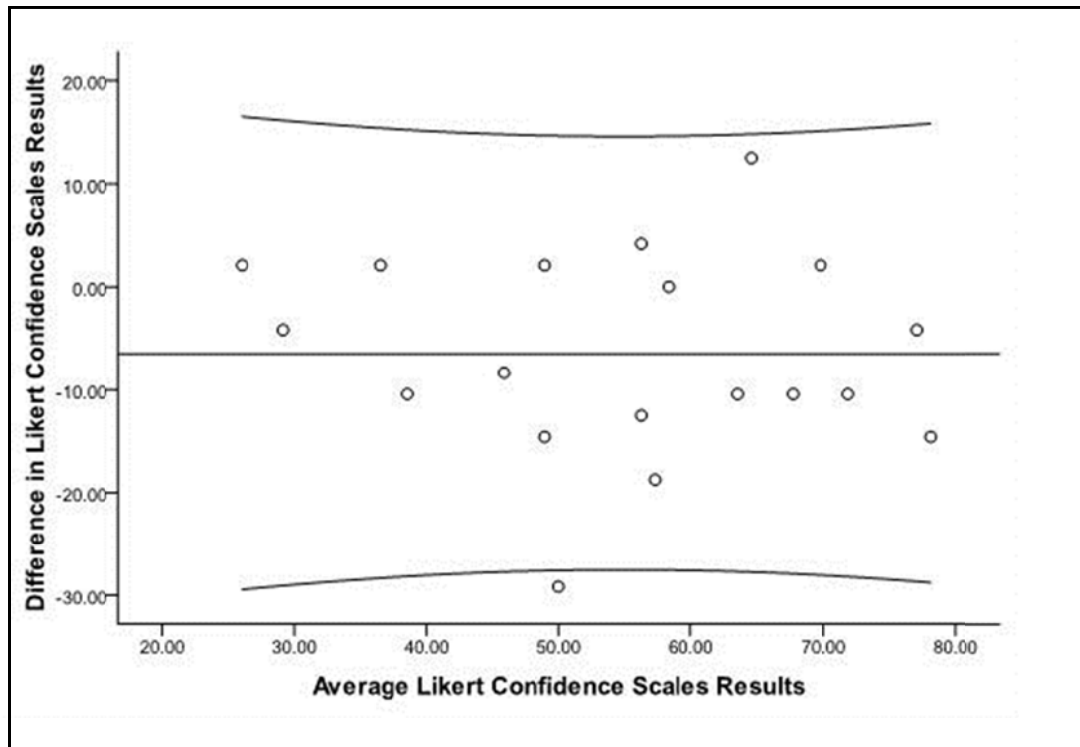


Figure 5: Difference against average confidence scores measured by Likert scales (n = 32)

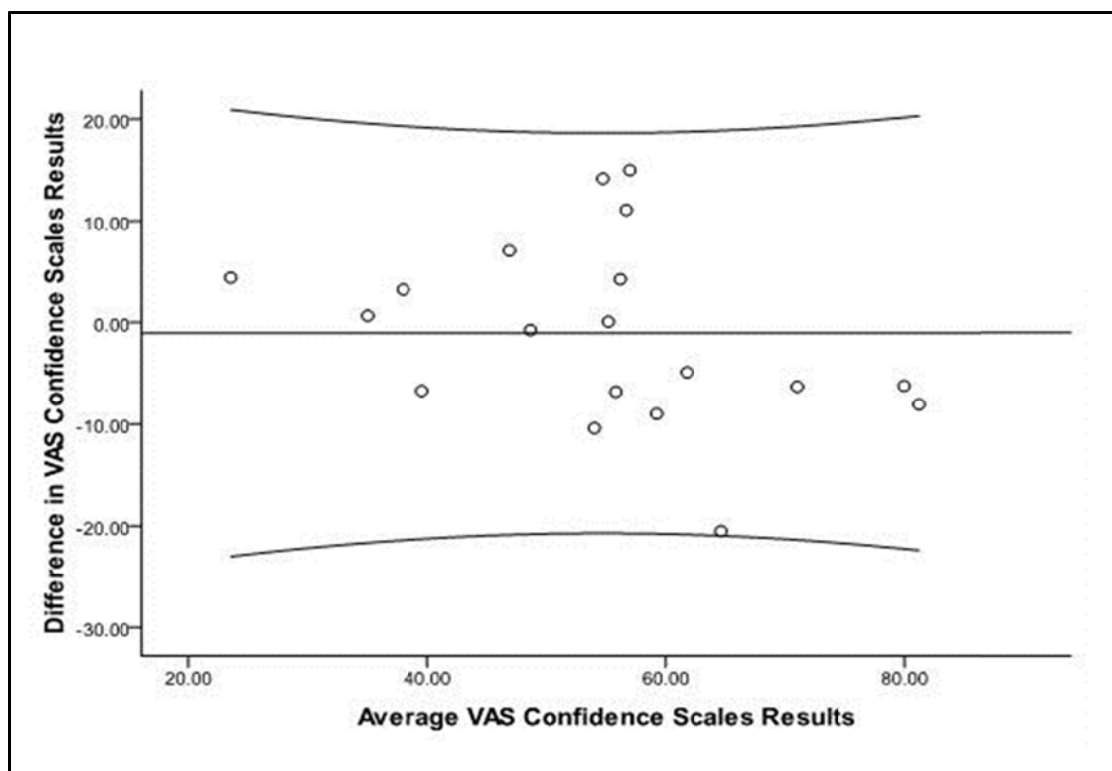
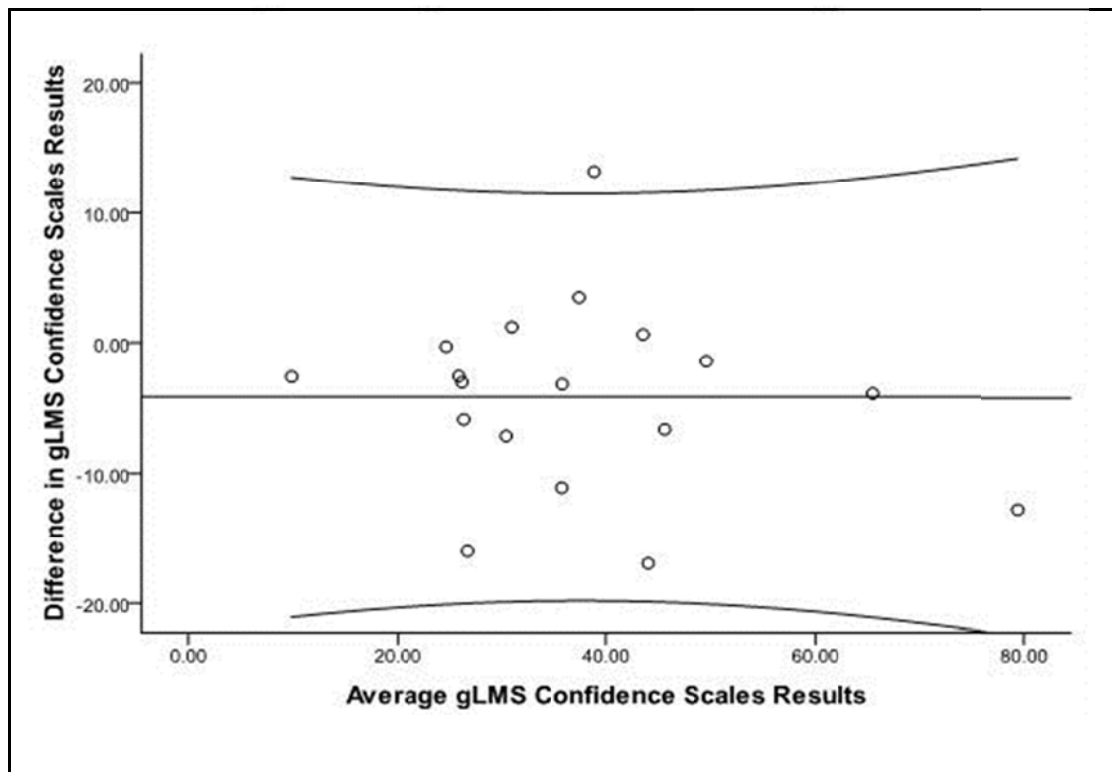


Figure 6: Difference against average confidence scores measured by VAS scales (n = 32)



**Figure 7: Difference against average confidence scores measured by gLMS scales (n = 32)**

In summary, as the sensitivity of the VAS results were comparable, if not higher, than Likert, and were reproducible. The VAS tool was chosen for the assessment of attitude within the main study questionnaire.

The gLMS did not give as close results to Likert, so not as comparable. When also considering practicalities, i.e. likelihood to take longer to interpret by the researcher and responder, as labels contain extreme statements (Bartoshuk et al., 2004), as well as paper space and printing being less efficient – hence the gLMS tool was not chosen for further use within the present study.



### **3.3. Main study**

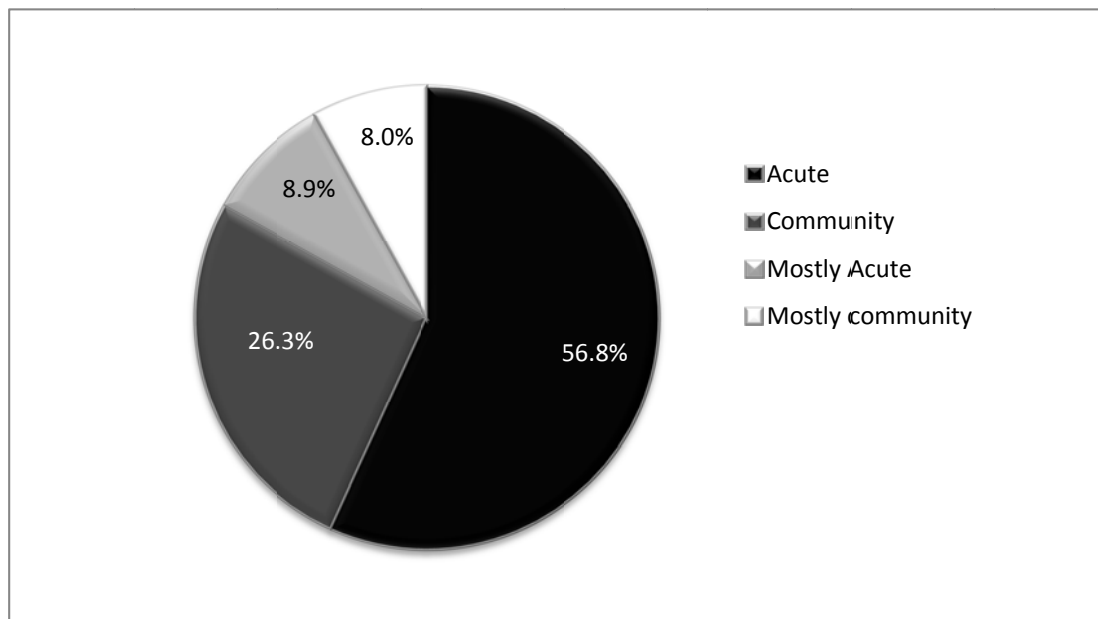
#### **3.3.1. Sample demographics**

The final sample who completed and returned the questionnaire totaled two hundred and thirteen responders (n = 213).

Three hundred and ninety seven questionnaires were posted to 31 trusts (acute/hospital and community/PCT departments) across the North West of England. Two hundred and thirteen questionnaires were returned; generating a response rate of 54% (184 questionnaires were not returned).

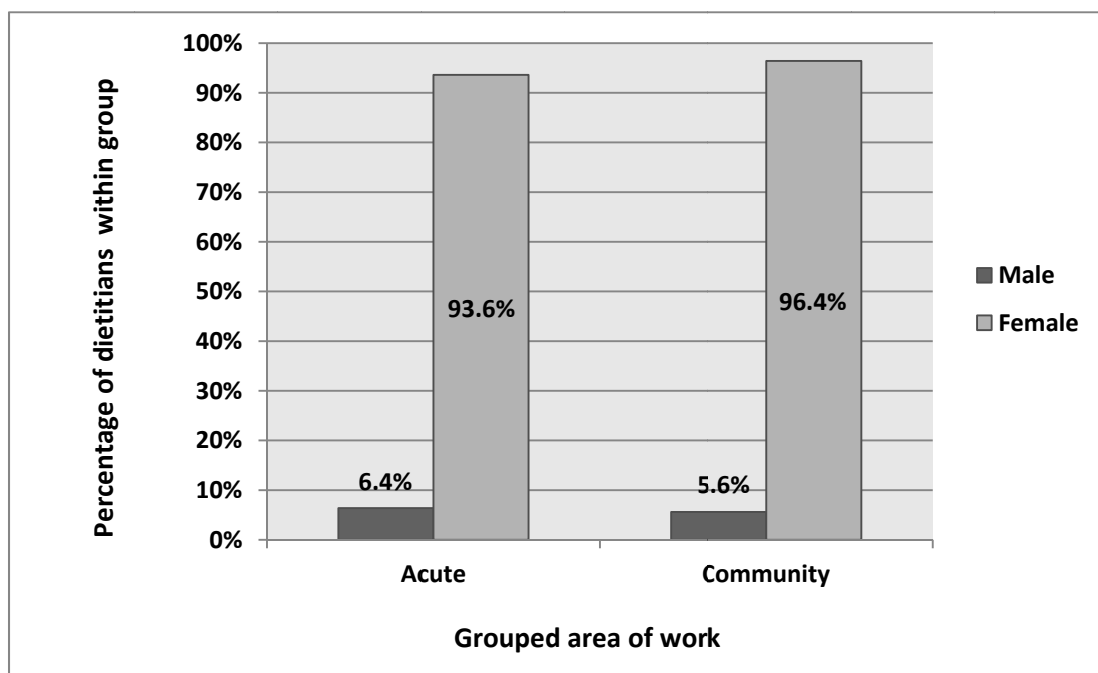
Of the 213 returned surveys 121 (56.8%) responders classed their designation as 'Acute', with a further 19 (8.9%) as 'Mostly acute'. Self assigned 'Community' workers accounted for 56 (26.3%) of responders with a further 17 (8%) 'Mostly community' (**figure 8**).

These self assigned designations have been combined to form two groups: Acute ('Acute' + 'Mostly Acute') n = 140 (65.7% of the sample) and Community ('Community' + 'Mostly Community') n = 73 (34.3% of the sample) for further statistical analyses.



**Figure 8: Proportion of dietitians by main area of work for the study sample (n = 213)**

In total, 13 of the responders were male (6.1%), 199 were female (93.4%); one responder failed to detail their gender. This proportion was maintained across both acute and community groups (**figure 9**).



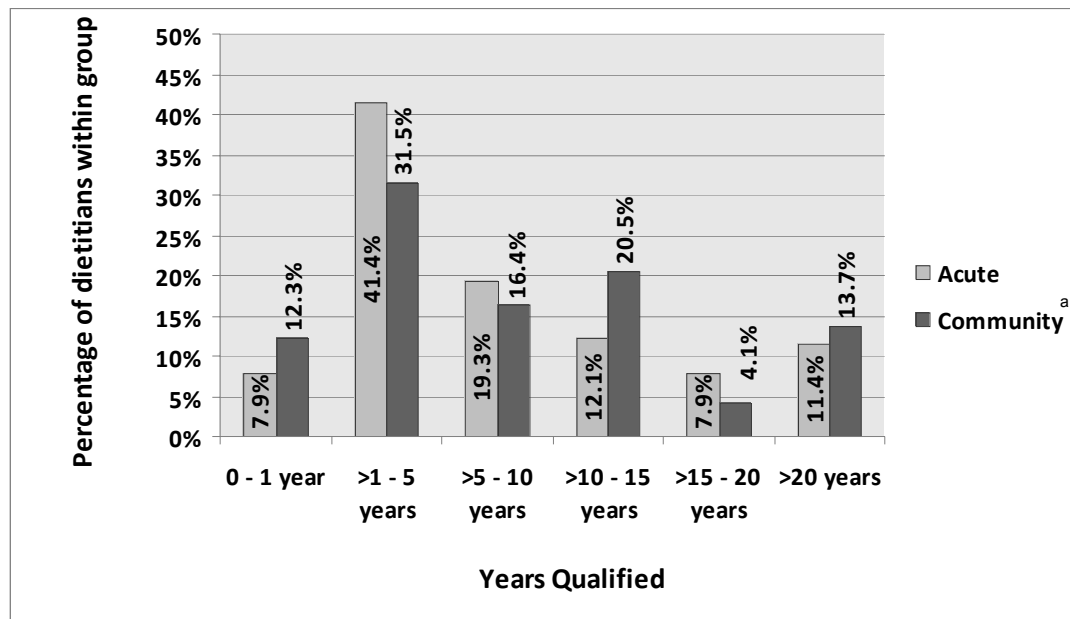
**Figure 9: Gender distribution of dietitians by area of work (n = 212)**

When considering the sample as a whole, the majority of responders (65.7%) had been qualified for 10 years or less; with the greatest number of responders (n = 81, 38%) being qualified for >1-5 years. One responder failed to report the number of years they had been qualified (**table 5**).

**Table 5: Count and percentage of years qualified for the study sample (n = 213)**

Years qualified	Frequency	Percent
0 - 1 year	20	9.4
>1 - 5 years	81	38
>5 - 10 years	39	18.3
>10 - 15 years	32	15
>15 - 20 years	14	6.6
>20 years	26	12.2
Missing data	1	0.5
<b>Total</b>	213	100

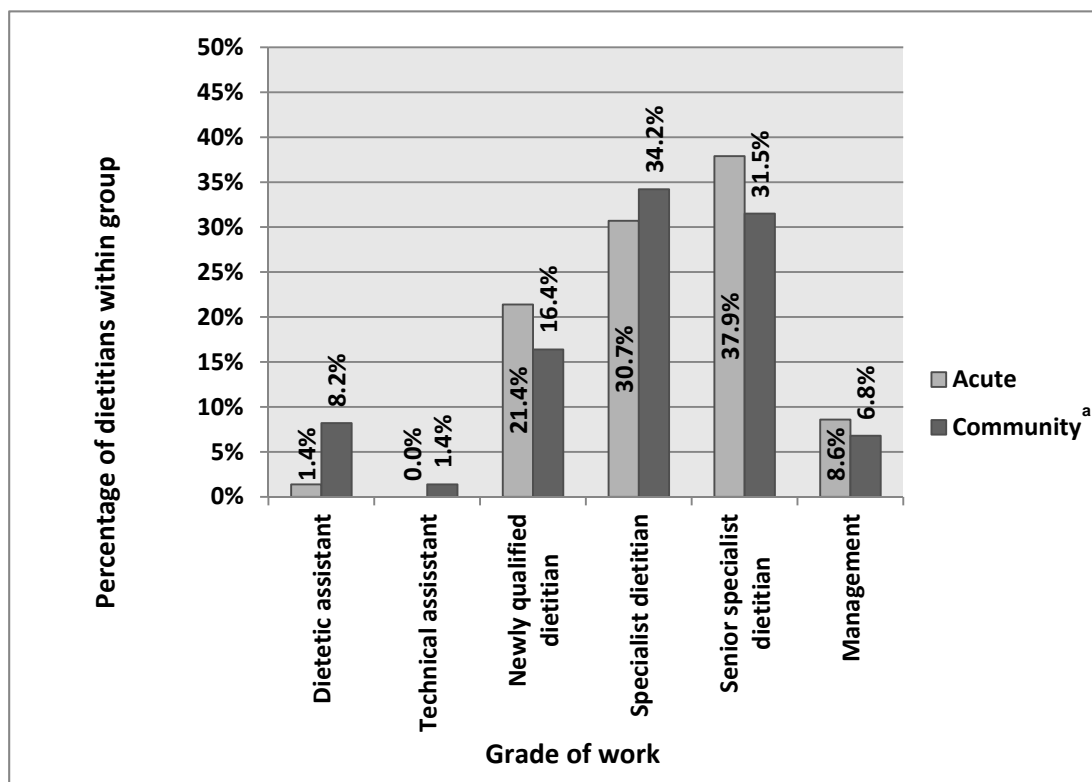
This pattern was also seen when considering acute and community groups. Ninety six acute responders (68.7%) and 44 (60.3%) of community responders had been qualified between 0 and 10 years, with the greatest proportion of acute and community (41.4% and 31.5% respectively) responders reporting being qualified within the >1-5 year category (**figure 10**).



<sup>a</sup>n = 1 (1.4%) missing data

**Figure 10: Percentage of dietitians for years qualified by area of work (n = 213)**

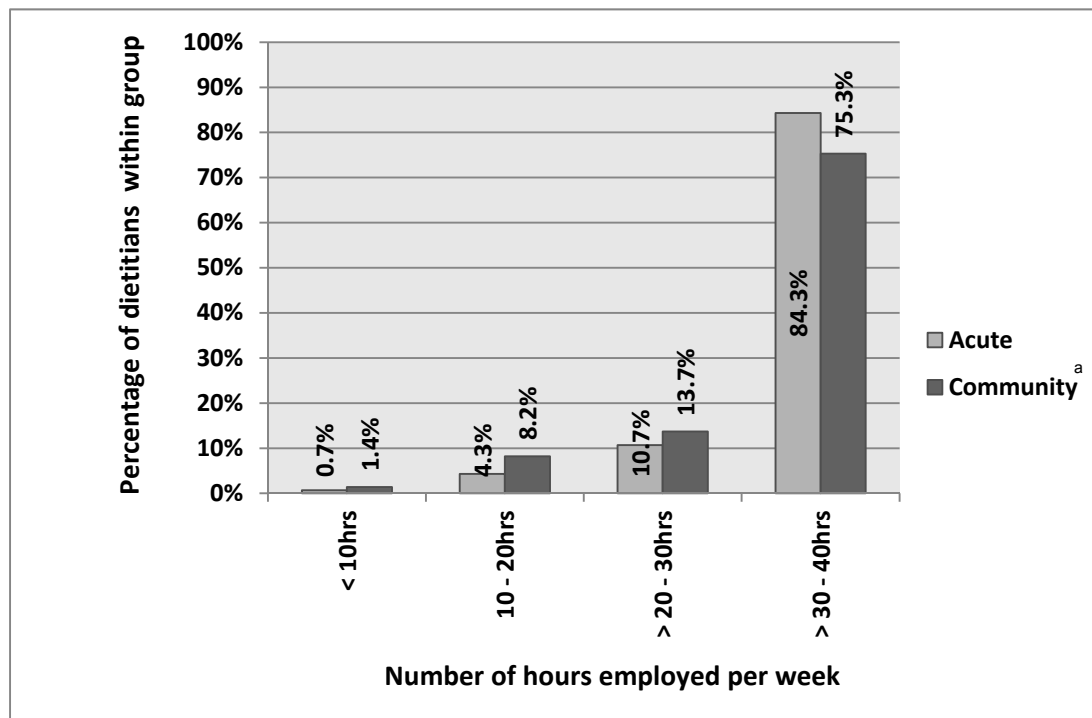
One hundred and eighty six (87.3%) of those completing the survey reported being employed at Band 5-7 level (i.e. newly qualified to specialist dietitian). The majority of responders reported being employed as specialist dietitians i.e. Band 6 and 7 (n = 68 [31.9%] and 76 [35.7%] respectively). This is true for the sample as a whole and when considering acute and community groups (**figure 11**). One responder reported being employed at Band 4 (1.4%) i.e. technical/dietetic assistant. Band 3 (i.e. dietetic assistant) responders accounted for 3.8% (n=8). Eight percent were at band 8a (i.e. managers) or higher (n=17). One responder failed to report an answer.



<sup>a</sup>n = 1 (1.4%) missing data

**Figure 11: Percentage of dietitians for grade/banding by area of work (n = 213)**

In total, 81.2% (n = 173) of all responders reported being full time employees of the NHS, contracted to >30 – 40 hours per week. One responder did not provide an answer and the remaining 39 responders (18.3%) were employed part-time (n = 2 [0.9%], 12 [5.6%], 25 [11.7%] for <10hr, 10-20hr, >20-30hr respectively; see figure 12).

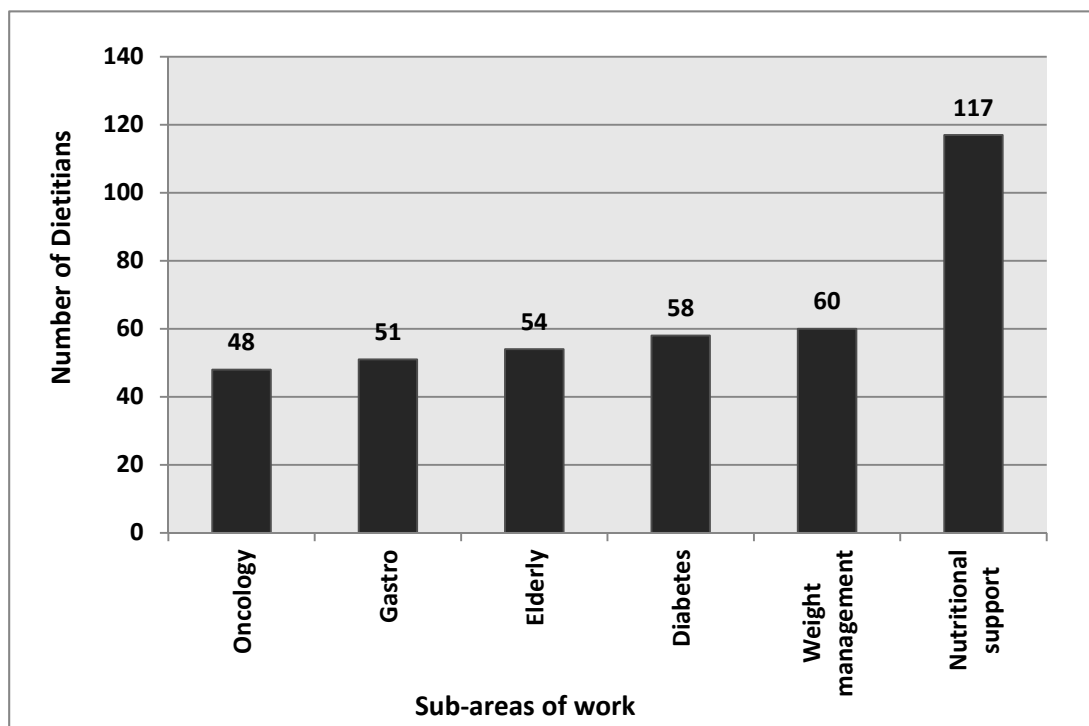


<sup>a</sup>n = 1 (1.4%) missing data

**Figure 12: Percentage of dietitians for number of hours employed by area of work (n = 213)**

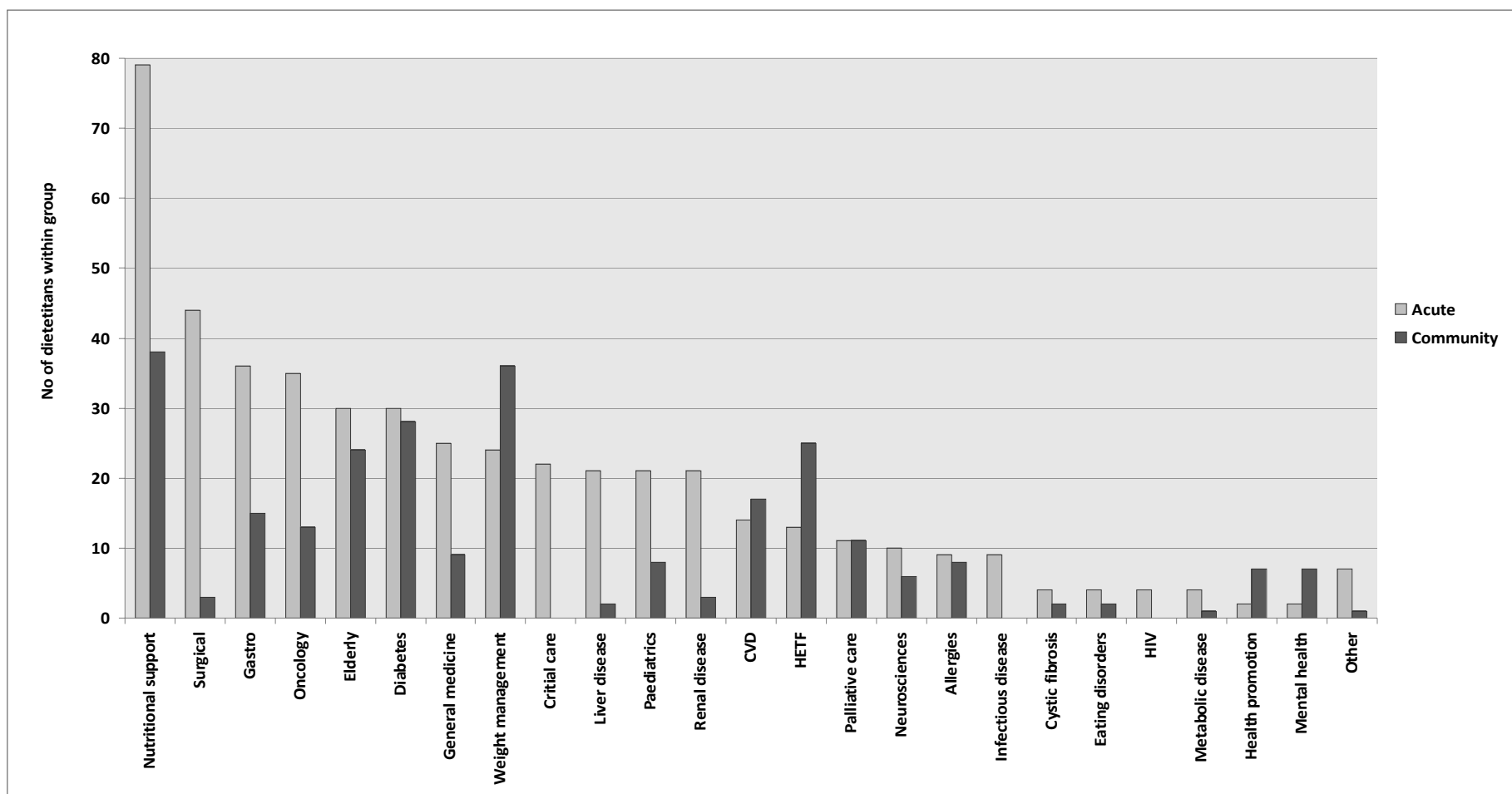
Responders were asked to indicate their main sub-areas of work (multiple responses were allowed). The most common sub-area of work overall was Nutrition Support with 117 (55%) responders noting that they worked within this area in some capacity. **Figure 13** illustrates the top 6 areas of working for all responders. The top 6 areas of working account for more than half of all responses.

Chi squares analysis was unable to be conducted for individual sub-areas of working for acute vs. community groups due to violation of the minimal cell frequency assumption. **Figure 14** represents the distribution of responses for sub-area of working for acute and community dietitians.



<sup>a</sup> Sub-areas of working are not mutually exclusive (multiple responses allowed)

**Figure 13: The 6 most prevalently chosen sub-areas of work<sup>a</sup> for the study sample (n=213)**



<sup>a</sup> Sub-areas of working are not mutually exclusive (multiple responses allowed)

**Figure 14: Number of responses for sub-area of work<sup>a</sup> for acute and community dietitians for the study sample (n = 213)**



### 3.3.2. Nutritional screening tools

Responders were asked to note the nutritional screening tool used within their Trust. The most commonly used screening tool was reported to be the Malnutrition Universal Screening Tool ('MUST') (BAPEN, 2003). One hundred and forty six responders (68.5%) reported using 'MUST' (n = 87 and 59 for acute and community responders respectively). Chi-squared ( $\chi^2$ ) analysis indicates that there was a statistically significant greater number of acute, compared with community, dietitians who reported using 'MUST' ( $\alpha = 0.005$ ,  $p < 0.05$ ).

Similarly, a statistically significant greater number of acute dietitians reported using their own screening tool compared with community dietitians (n= 45 (32%) and 9 (13%) respectively;  $\alpha = 0.002$ ,  $p < 0.05$ ).

For all other screening tools there were no statistical differences between acute and community dietitians reported use.

The least reported used screening tools were the Mini Nutritional Assessment (MNA), Nutrition Risk Index (NRI), Subjective Global Assessment (SGA), The Nursing Nutritional Screening Form (NNSF) and Prognostic Nutritional Index (PNI). Seven responders reported not using a nutritional screening tool at all. **Table 6** describes screening tool usage by acute and community dietitian groups.

**Table 6: Comparison of nutritional screening tools employed by acute and community dietitians (n = 213)**

Screening tool	Area of working	Expected count	Count	% within group	% of total	p value (2-sided)
Only a single measure	Acute	12.5	8	42.1	3.8	0.23
	Community	6.5	11	57.9	5.2	
'MUST'	Acute	96	87	59.6	40.8	0.005**
	Community	50	59	40.4	27.7	
MNA	Acute	0.7	0	0	0	0.17
	Community	0.3	1	100	0.5	
NRI	Acute	2.6	2	50	0.9	0.50
	Community	1.4	2	50	0.9	
RNNRC	Acute	0.7	0	0	0	0.17
	Community	0.3	1	100	0.5	
SGA	Acute	5.3	3	37.5	1.4	0.9
	Community	2.7	5	62.5	2.3	
NNSF	Acute	140	140	65.7	65.7	\$
	Community	73	73	34.3	34.3	
PNI	Acute	140	140	65.7	65.7	\$
	Community	73	73	34.3	34.3	
None	Acute	4.6	4	57.1	1.9	0.63
	Community	2.4	3	42.9	1.4	
Own screening tool	Acute	35.5	45	83.3	21.1	0.002**
	Community	18.5	9	16.7	4.2	
Own tool based on another tool	Acute	6.6	8	80	3.8	0.33
	Community	3.4	2	20	0.9	
Other	Acute	11.2	11	64.7	5.2	0.93
	Community	5.8	6	35.3	2.8	

\*\*p< 0.01statistically significant difference between groups. \$ Violation of minimum expected cell frequency i.e. unable to conduct Chi-square analysis due to limited data.

### 3.3.3. Perceived confidence

When confidence scores for taking anthropometric measurements are considered as an average or overall confidence score ( $n = 206$ ), via VAS assessment, results appear to be normally distributed for both acute and community working dietitians. This is shown via histograms and by the scores following closely the expected line on normal probability plots (Normal Q-Q Plots) (Pallant, 2007).

Two hundred and six responders completed the confidence questions section (7 failed to fully complete this section). For the study sample confidence was greatest for calculating BMI ( $96.4 \pm 7.7$ mm on 100mm VAS scale) followed by weight ( $94.6 \pm 9.5$ mm on 100mm VAS scale) and height ( $89.2 \pm 14.1$ mm on 100mm VAS scale). Confidence for measuring head circumference and body mass via BodPod were lowest of all the 13 anthropometric questions asked. **Table 7** shows mean confidence scores and descriptive statistics for all anthropometric measurements assessed.

An independent samples t-test was conducted to compare the confidence scores between acute and community working dietitians for each of the anthropometric measures questioned. There were statistically significant differences between the mean confidence scores for acute and community dietitians when taking skin fold ( $\alpha=0.000$ ;  $p<0.01$ ), MAC ( $\alpha=0.000$ ;  $p<0.01$ ), demi-span ( $\alpha=0.001$ ;  $p<0.01$ ), knee height ( $\alpha=0.001$ ;  $p<0.01$ ) and head circumference ( $\alpha=0.002$ ;  $p<0.01$ ) measurements (**table 7**).

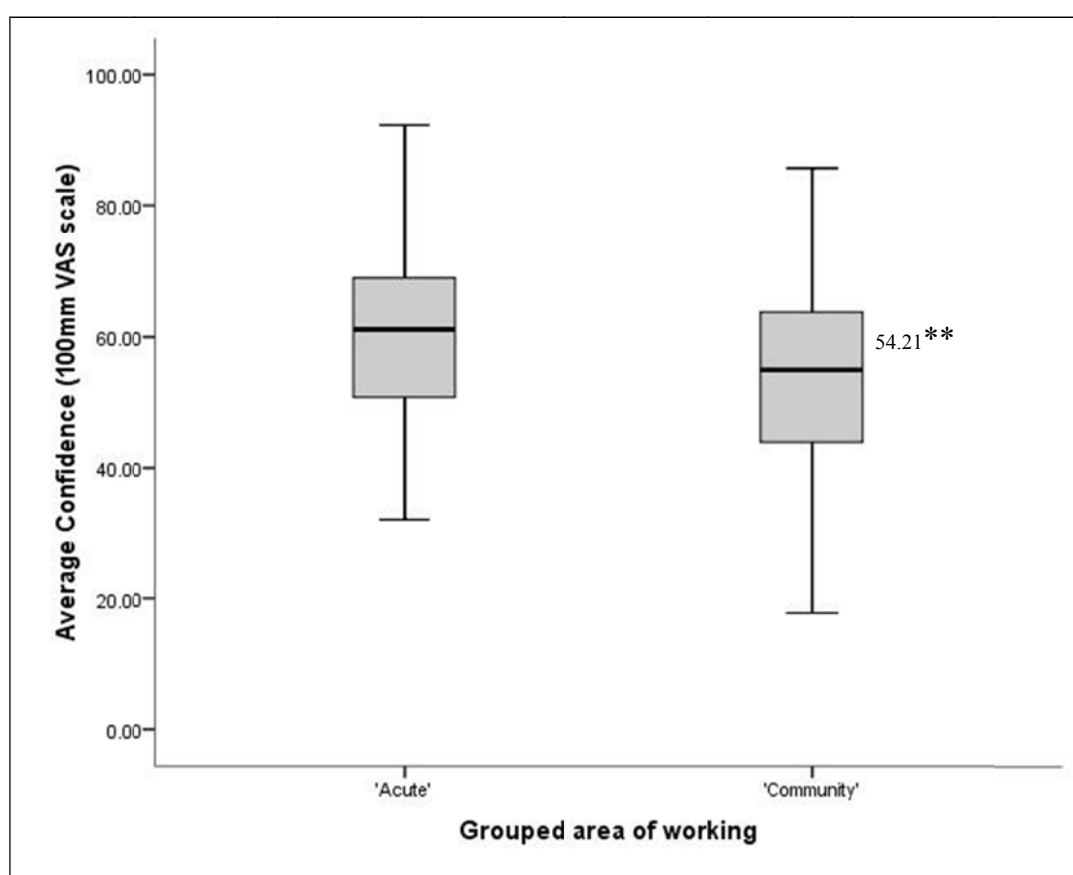
There was no statistically significant difference in average confidence ratings for taking height, weight, BMI, ulna length, WC, hip circumference, WHR, and BodPod measurements between acute and community working dietitians.

**Table 7: Mean and SEM of perceived confidence scores (100mm VAS) for taking various anthropometric measurements for the study sample and by area of work (n = 206)**

Anthropometric measurement	Whole group (n = 206)		Acute (n = 134)		Community (n = 72)		
	Mean confidence	SEM	Mean confidence	SEM	Mean confidence	SEM	
BMI	96.38	0.53	96.51	0.57	96.14	1.09	
Weight	94.59	0.65	94.36	0.79	95.03	1.14	
Height	89.18	0.98	88.99	1.28	89.53	1.49	
MAC	67.73	1.84	73.62	1.93	56.60	3.56	**
Waist circumference	67.01	1.66	66.83	1.91	67.36	3.17	
Ulna length	56.37	2.25	58.49	2.62	52.37	4.21	
Waist to Hip ratio	55.25	1.97	56.22	2.38	53.41	3.49	
Hip circumference	53.84	2.02	53.92	2.45	53.68	3.56	
Demi span	50.39	2.14	55.43	2.48	40.79	3.82	**
Knee height	48.1	1.99	52.78	2.36	39.19	3.42	**
Skin fold	45.6	1.94	50.84	2.31	35.68	3.26	**
Head circumference	21.53	1.87	25.12	2.57	14.74	2.20	**
BodPod	11.06	1.20	11.54	1.54	10.14	1.87	

\*\* Statistically significant differences between acute and community dietitians ( $p < 0.01$ ).

An independent samples t-test (equal variance assumed) showed that overall confidence of community dietitians was statistically significantly lower than acute dietitians' confidence scores at taking anthropometric measures (significance level  $\alpha = 0.002$ ;  $p < 0.01$ ). Both groups have a wide range of average confidence scores (community mean:  $54.21 \pm 14.78$ mm on 100mm VAS and acute mean:  $60.27 \pm 12.11$ mm on 100mm VAS) with no outliers or extreme points ranges: 32-92mm and 17-85mm for acute and community dietitians respectively), see **figure 15**.



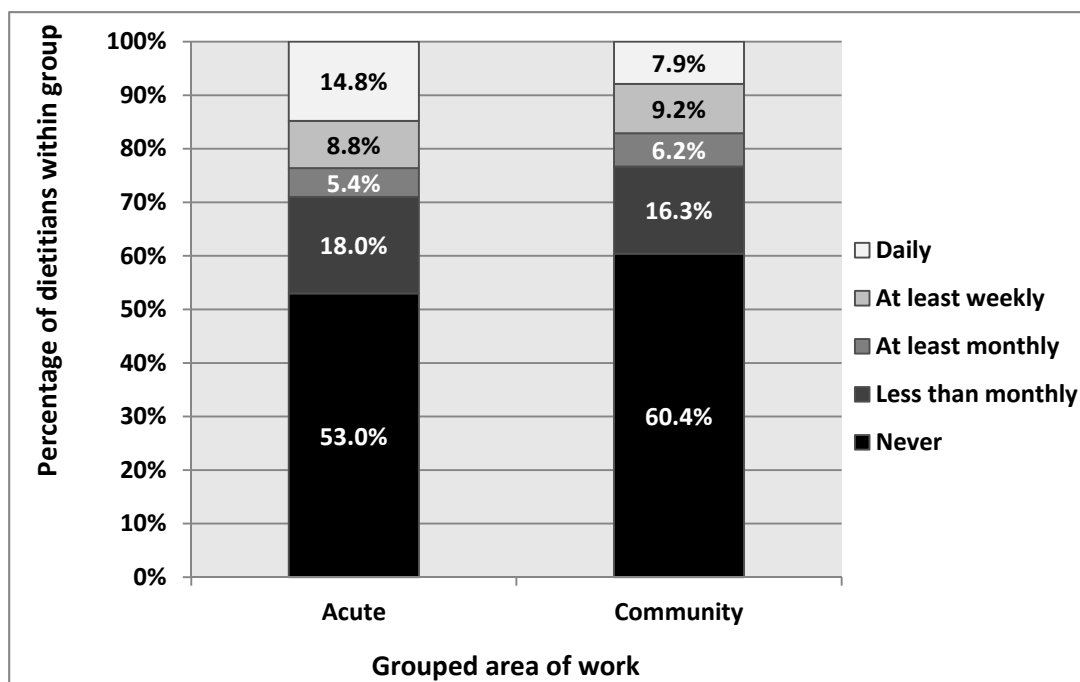
\*\*p < 0.01, statistically significant difference between acute and community mean confidence scores

**Figure 15: Average confidence scores when taking anthropometric measurements by area of work (n = 206)**

In summary, community dietitians reported significantly lower confidence ratings when measuring anthropometry in general than acute dietitians. Acute dietitians were more confident when taking skin fold, MAC, demi-span, knee height and head circumference measurements specifically.

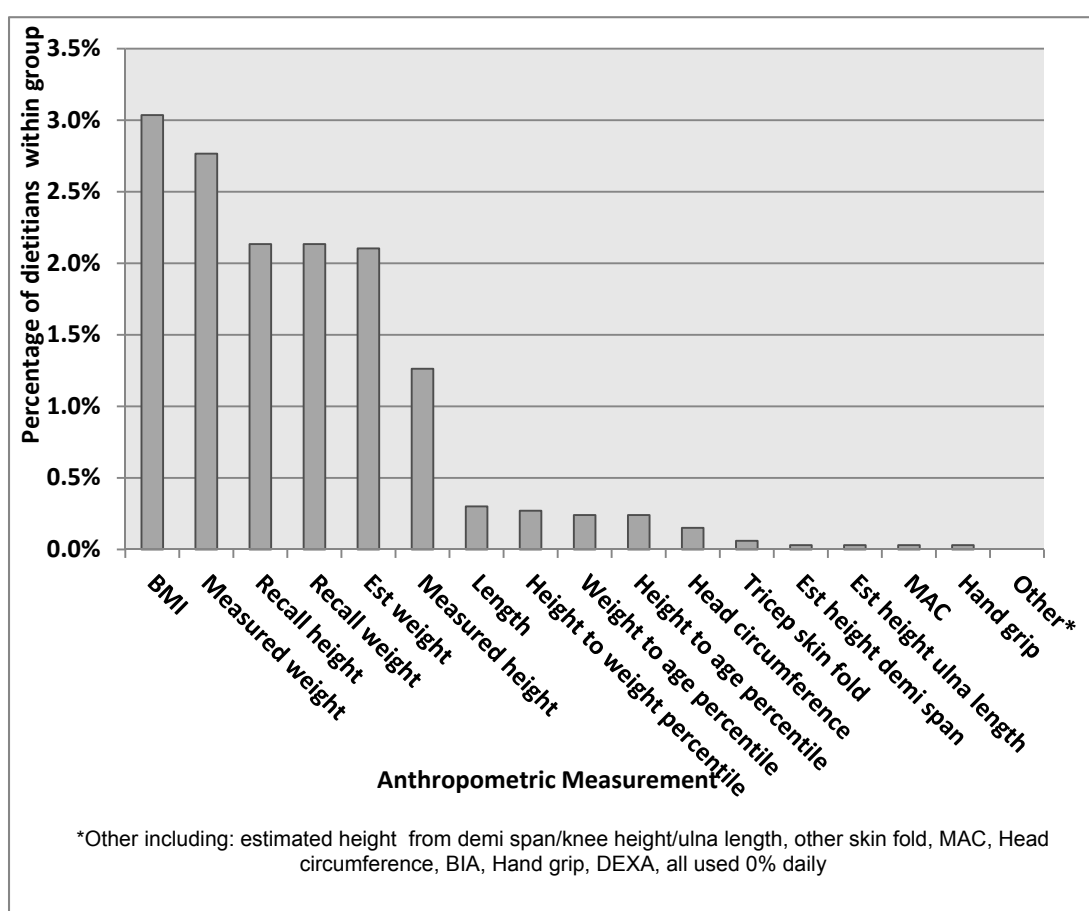
#### 3.3.4. Frequency of use

The majority of anthropometric measurements questioned were reported to be taken, by both community and acute working dietitians, on an infrequent basis i.e. “Never” or “Less than monthly”. Although not statistically tested, due to small numbers per response option, there appears to be a significantly higher proportion of acute dietitians taking measurements frequently i.e. “Daily” (14.8%) than community (7.9%) dietitians (**figure 16**). Three responders failed to complete all frequency of use questions.

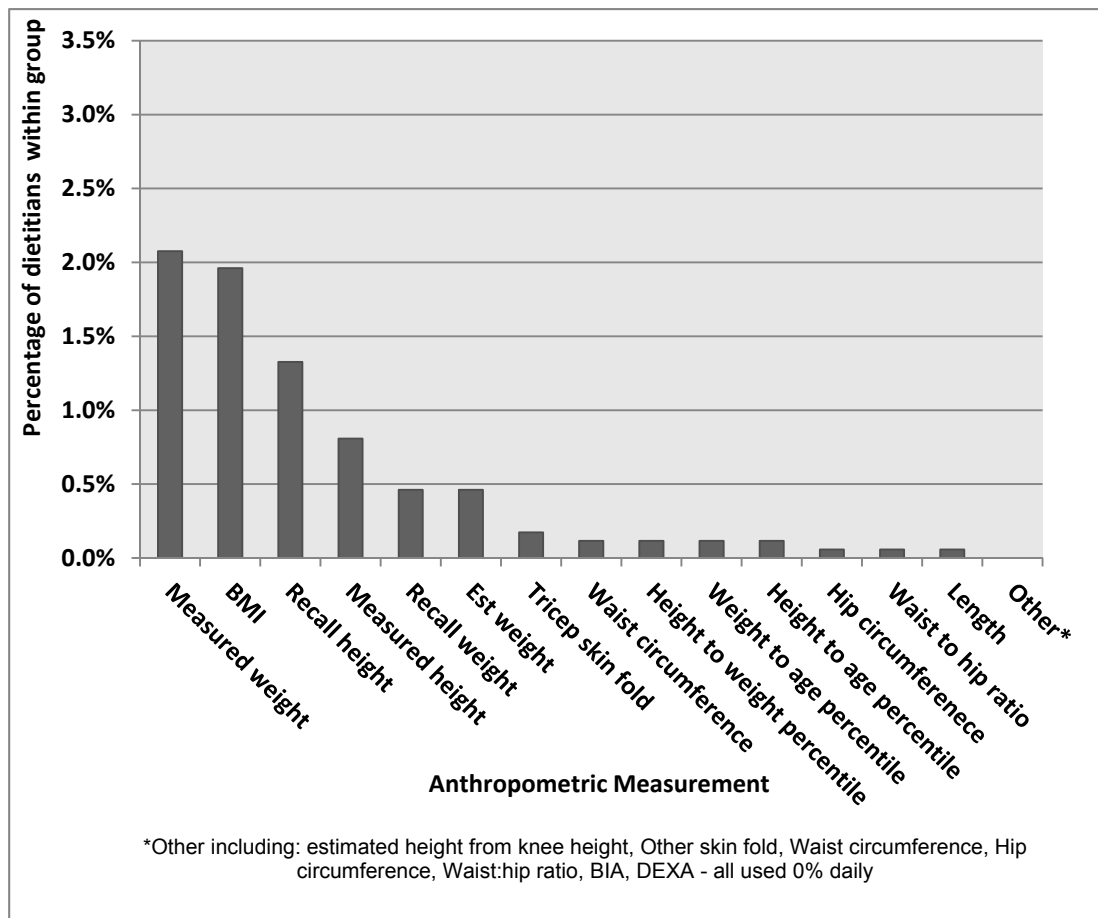


**Figure 16: Percentage of dietitians for frequency of anthropometric use for all measurements by area of work (n = 210)**

The measurements reported to be taken on a 'Daily' basis were the same for both acute and community dietitians. **Figures 17** and **18** illustrate that weights and heights were the most commonly 'Daily' used anthropometric measurements including: measured, estimated and recalled weight, measured and recalled height, and BMI. **Figure 19** highlights the most prevalently rated 'Never' used anthropometric measures for all responders by area of work, in order of prevalence of acute responses.



**Figure 17: Percentage of acute dietitians for 'Daily' anthropometry use (n = 140)**



**Figure 18: Percentage of community dietitians for 'Daily' anthropometry use (n = 73)**



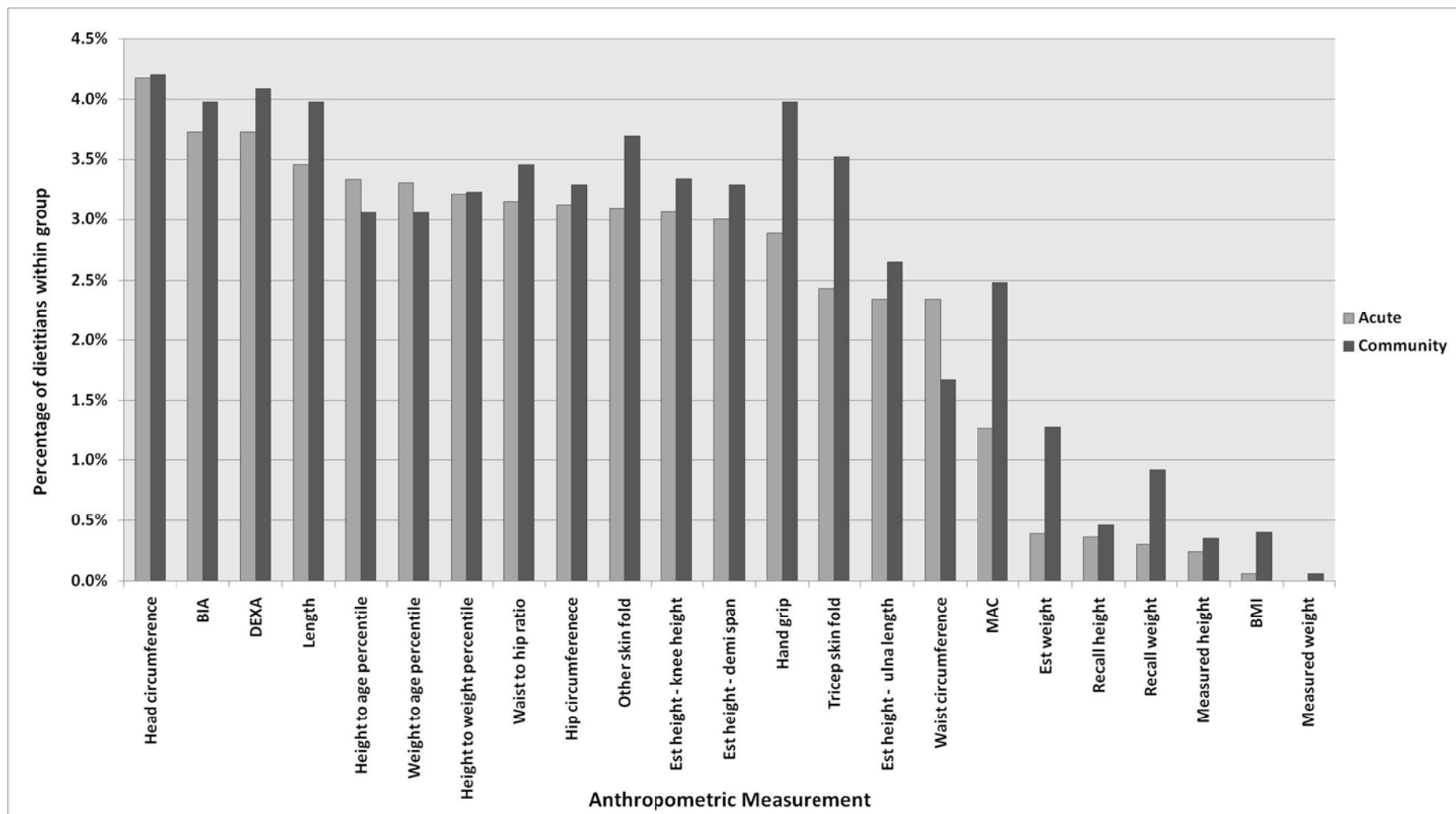
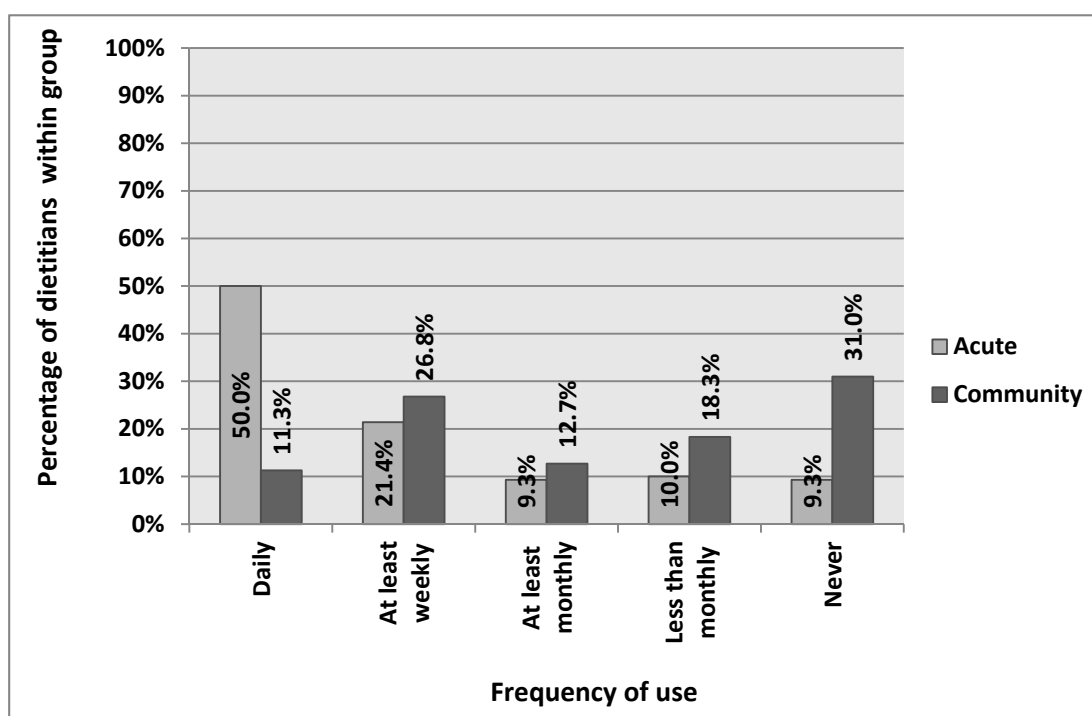


Figure 19: Percentage of dietitians for anthropometry 'Never' used by area of work (n = 210)

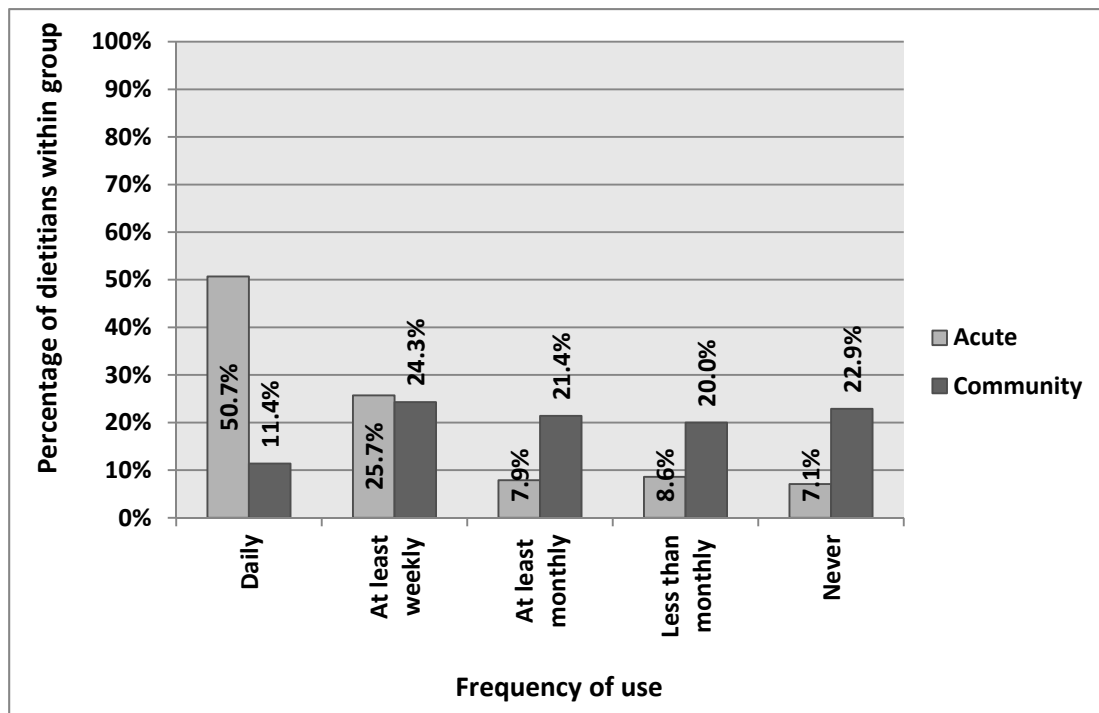
Chi-squared ( $\chi^2$ ) analysis was possible for recalled height, estimated weight and recalled weight. It was not possible for all other variables due to violation of minimal cell count assumptions.

Chi-squared ( $\chi^2$ ) analysis revealed that there was no statistically significant difference between acute and community dietitians use of recalled height ( $\alpha = 0.81$ ,  $p > 0.05$ ).

There was a statistically significant difference between acute and community dietitian's frequency of use for estimated weight ( $\alpha = 0.00$ ,  $p < 0.05$ ) (**figure 20**), and recalled weight ( $\alpha = 0.00$ ,  $p < 0.05$ ) (**figure 21**). Chi squared tests failed to detail the specific frequency of use category where significant difference levels occurred, and consider overall frequency of use differences only. The following graphs illustrate these patterns.



**Figure 20: Percentage of frequency of use for 'Estimated weight' by area of work (n = 210)**



**Figure 21: Percentage of frequency of use for 'Recalled weight' by area of work (n = 210)**

The summary of this analysis suggests that anthropometry in general is taken on an infrequent basis as estimated and recalled weights do not make use of any measurements. Acute dietitians reported taking measurements on a 'Daily' basis more frequently than community colleagues with heights, weights and BMI being most commonly used measures. There is a significant difference between groups in the use of estimated and recalled weight ( $p < 0.05$ ).

### 3.3.5. Perceived barriers

The most commonly chosen reason as a barrier towards taking anthropometric measurements for the whole group was "not appropriate for patient" which accounted for over 15% of all indicated reasons; followed by "lack of equipment" and "time constraints / work load", which accounted for 13.3% and 10.7% respectively of all indicated barriers.

When considering acute and community dietitians separately, both groups indicated that “not appropriate for patient” was the most commonly chosen barrier (9.9% and 5.8% within group respectively). Similarly, “lack of equipment” was the second most prevalent barrier choice (9.2% for acute and 4.1% for community). The third most commonly indicated barrier towards anthropometry differed between the groups. “Time constraints / work load” was more commonly chosen by acute (11.7%) than community responders (8.4%); whereas “Don’t feel I need to” was more commonly chosen by community (12.3%) than acute (7.9%) colleagues (**table 8**).

**Table 8: Perceived barriers of anthropometric use by acute and community dietitians (n = 213)**

Barriers (Multiple choice)	Count (% within group total)		
	'Acute'	'Community'	Total
Not appropriate for patient	91 (14.4%)	53 (18.6%)	144 (15.7%)
Lack of equipment	84 (13.3%)	38 (13.3%)	122 (13.3%)
Time constraint/work load	74 (11.7%)	24 (8.4%)*	98 (10.7%)
Lack of training	60 (9.5%)	29 (10.2%)	89 (9.7%)
Don't need to	50 (7.9%)	35 (12.3%)	85 (9.3%)
Lack of confidence	48 (7.6%)	11 (3.9%)**	59 (6.4%)
Lack of competency	42 (6.6%)	20 (7.0%)	62 (6.8%)
Too invasive	41 (6.5%)	10 (3.5%)	51 (5.6%)
Not required by department policy	38 (6.0%)	10 (3.5%)	48 (5.2%)
Taken by other health professionals	24 (3.8%)	15 (5.3%)	39 (4.2%)
No accurate equipment	22 (3.5%)	9 (3.2%)	31 (3.4%)
Patients do not like it	19 (3.0%)	11 (3.9%)	30 (3.3%)
Other	16 (2.5%)	2 (0.7%)	18 (2.0%)
Lack of evidence	14 (2.2%)	14 (4.9%)	28 (3.1%)
Useful in research only	10 (1.6%)	4 (1.4%)	14 (1.5%)
<b>TOTAL</b>	<b>633 (100%)</b>	<b>285 (100%)</b>	<b>918 (100%)</b>
* Statistically significant differences between groups ( $p \leq 0.05$ )			
** Statistically significant differences between groups ( $p < 0.01$ )			

A chi-squared ( $\chi^2$ ) analysis for the difference in perceived barriers towards anthropometric measurements between acute and community dietitians revealed a statistically significant difference for “lack of confidence” and “time constraints / work load” as indicated barriers.

For “lack of confidence” acute dietitians expected counts were 38.8, whereas actual count was 48, and for community expected count was 20.2, whereas actual count was 11. Pearson  $\chi^2$  analysis indicated a significance level (2 sided) of 0.003;  $p < 0.01$ .

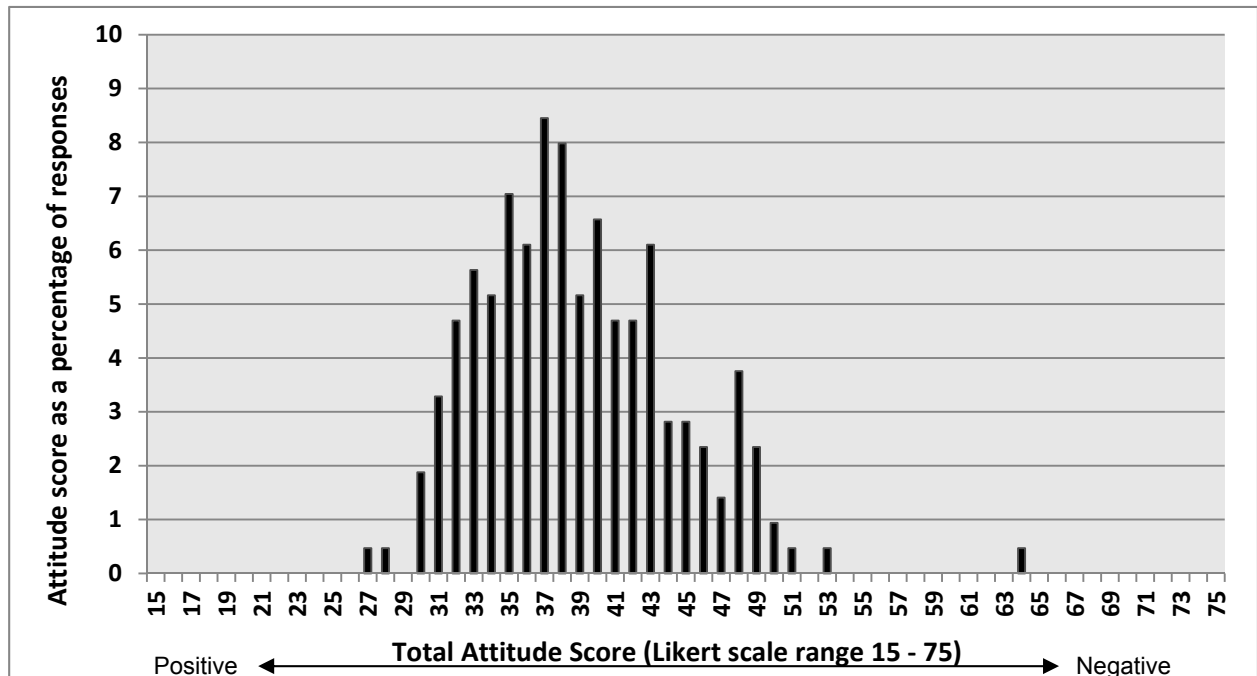
For “time constraints” acute dietitian’s expected and actual counts were 64.4 and 74 respectively and community dietitian’s were 33.6 and 24 respectively. Pearson  $\chi^2$  analysis indicates a significance level of 0.05 ( $p \leq 0.05$ ).

A Chi squared analysis was unable to be conducted for the barrier “useful in research only” as the minimum expected cell frequency was violated. All other barriers were not significantly different between acute and community dietitians ( $p > 0.05$ ).

The conclusion of this analysis is that a statistically significant greater proportion of acute dietitians rated ‘lack of confidence’ and ‘time constraints’ as barriers towards anthropometry than community colleagues. Therefore, the alternative hypothesis can be accepted as there was a significant difference between area of work in perceived barriers (namely, ‘lack of confidence’ and ‘time constraint / work load’).

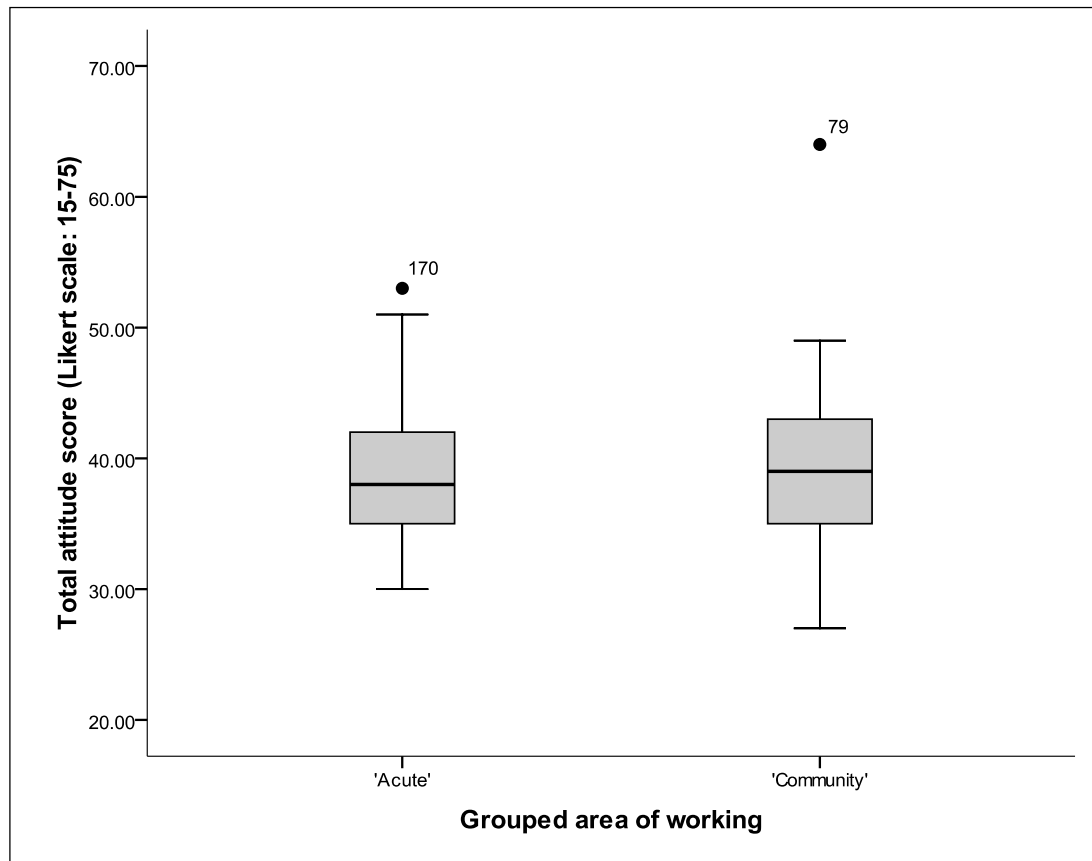
### 3.3.6. Attitudes towards anthropometry

The results for all the 15 attitude items, rated on a 5 point Likert scale, were combined to investigate the total attitude towards anthropometry. Descriptive statistics and a histogram (**figure 22**) indicate that there was a slight bias towards “positive attitudes” to anthropometry for the study sample overall (n = 205; 8 responders failed to complete all 15 sub-questions). The average score was 38.9 (i.e. closer to 15 than 75), with a SD of 5.51 (median 38.0, mode 37.0, minimum value 27 and maximum value 64) for the study sample.



**Figure 22: Distribution of attitude scores towards anthropometry for the study sample (n = 205)**

There is no significant difference between acute (38.64; SD 5.2, min = 30, max = 53) and community (39.31; SD 6.08, min = 27, max = 64) responders overall (mean) attitude scores towards anthropometry ( $p > 0.05$ ), **figure 23**.



**Figure 23: Comparison of mean attitude scores towards anthropometry use by acute and community dietitians (n = 205)**

Chi-squared analysis was not possible for individual attitude questions as the minimum cell frequency assumption had been violated. Statistically significant differences between acute and community responder's perception of attitude towards such questions could therefore not be assessed, an exploration of the results, however, is presented below.

When considering the group as a whole it was found that there was not a majority positive or negative attitude towards the following, with an approximate equal distribution of those 'agreeing' and 'disagreeing' or the majority of responders reporting being 'uncertain':

- 'Skin fold measurements provide little additional information beyond weight',
- 'Patients do not like invasive measurements',

- 'Lack of equipment / training / time...is the greatest downfall when considering taking anthropometric measures'.

The highest proportion of responses (45.7%) agreed with the statement: 'Anthropometry is a unique role of a dietitian'. Almost three quarters (72.6%) of responses indicated strong agreement with 'Nutritional screening is a necessity'. The majority of responses agreed or strongly agreed with the following statements:

- 'Anthropometry is essential for monitoring patients' (84.9%);
- 'Anthropometry forms a vital part of nutritional assessments' (84.9%),
- 'Other anthropometric measurements are always needed in addition to weights' (46.3%).

The majority of responders either disagreed or strongly disagreed with the following:

- 'BMI has very limited use' (45%);
- 'Anthropometry is best taken by other Health Professionals' (62.3%);
- 'BMI has very limited use beyond initial screening' (55.2%);
- 'Invasive anthropometric measurements are a barrier to consultations' (43.9%);
- 'Estimated or recalled weight is sufficient' (51.6%).

### 3.3. 7. Training

#### 3.3.7.1. *Training received*

Responders were asked to note where they had received anthropometric training (multiple answers were allowed). The majority of responders (n= 180, 84.9%) noted that they had received training at university. Ninety three (n = 93, 43.9%) and fifty (n= 50, 23.6%) responders noted that training had been received on the job and via an external course respectively. Qualitatively the majority of external courses were noted to be PENG and paediatric training courses.

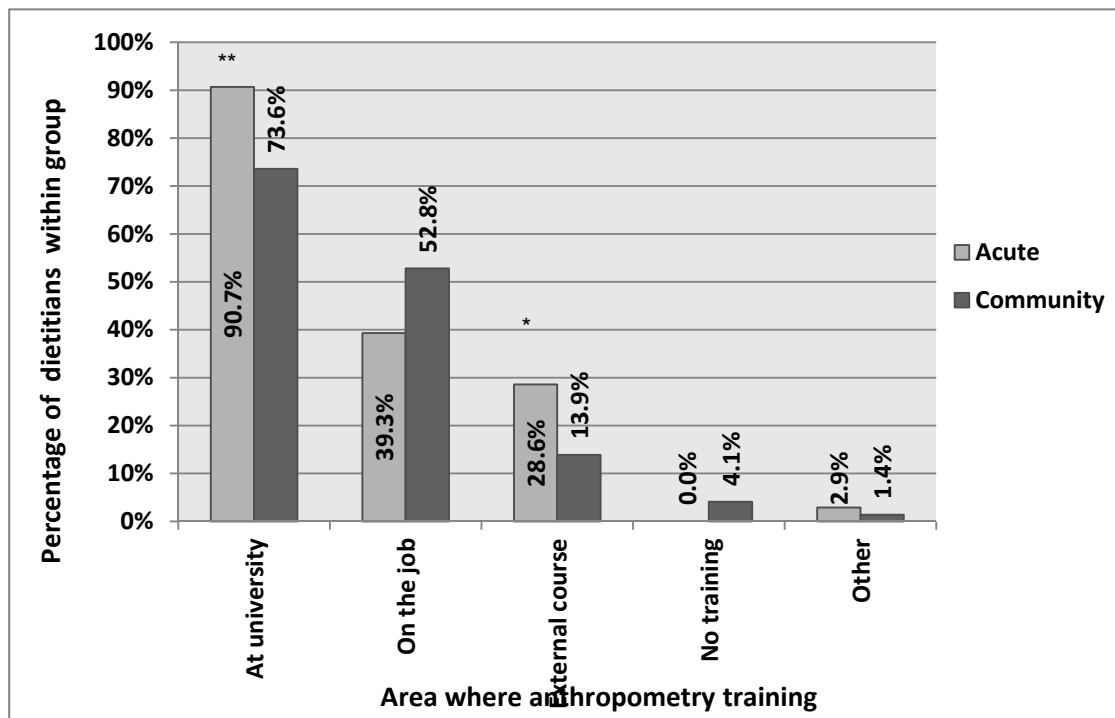


Almost 1.4% of responders (n = 3), all of which were noted to be community responders, reported that they had received no anthropometric training.

Chi-squared ( $\chi^2$ ) analysis was conducted to investigate if there was a relationship between area of work and training received. The minimum expected cell frequency was violated for the 'No training' and 'Other' categories. Analysis could therefore not take place for these categories but was performed for training received at university, on the job and at an external course (**figure 24**).

Using Yates' Correct for Continuity (2 by 2 design) a statistically significant difference was detected (Correction for Continuity significance level (2 sided) was 0.002 [ $p < 0.01$ ]) when considering area of work and training at university. The effect of Yates' correction is to prevent overestimation of statistical significance for small data, which is argued to occur if employing Pearson's  $\chi^2$ . This formula is chiefly used when at least one cell of the table has an expected count smaller than 5 (i.e. with 2 x 1 and 2 x 2 contingency tables - when variables are limited and fixed) (Pallant, 2007). Significantly more acute (90.7%) than community (73.6%) dietitians had received training at university. This held when considering area of work and external training courses, with more acute dietitians (28.6%) than community dietitians (13.9%) attending external courses ( $\alpha = 0.027$ ,  $p < 0.05$ ).

Chi-squared ( $\chi^2$ ) analysis did not show any significant differences between acute (39.3%) and community (52.8%) dietitians for training location for 'training on the job' (**figure 24**).



\* Statistically significant difference between groups ( $p < 0.05$ )

\*\* Statistically significant difference between groups ( $p < 0.01$ )

**Figure 24: Percentage of dietitians for each location of receiving training by area of work (n = 212)**

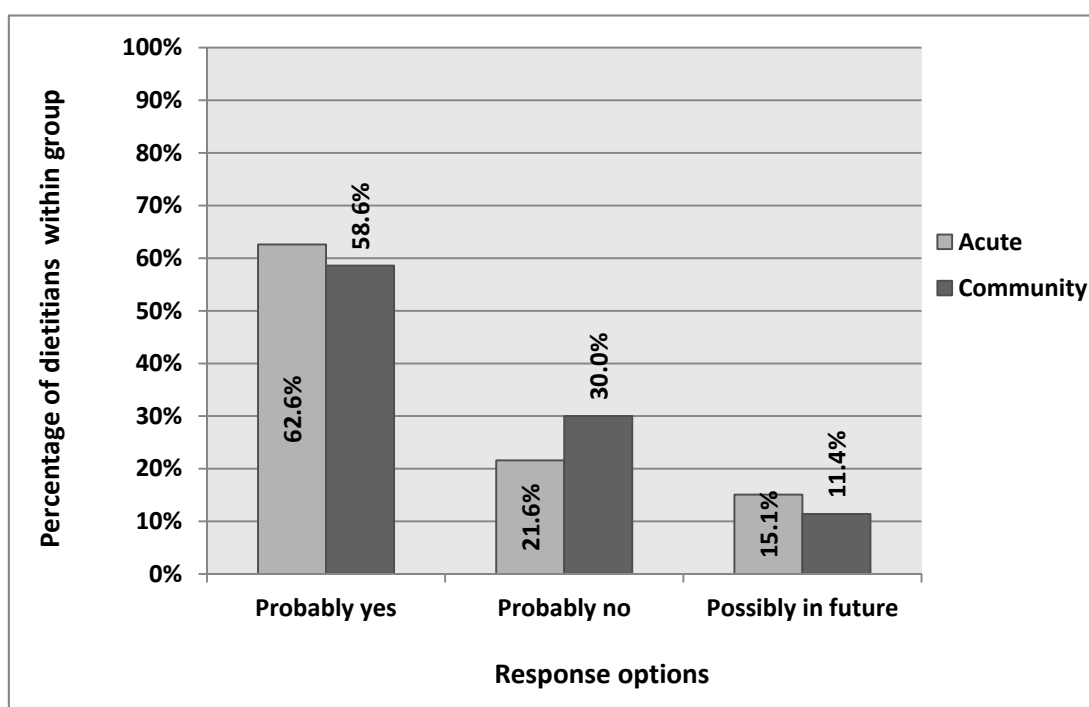
#### 3.3.7.2. Future training

Two hundred and nine respondents provided answers to whether, professionally, they would like to attend anthropometric training sessions or courses in the future. Chi squared analysis was not possible due to violation of minimal cell frequency counts for this question. The majority of all responders (n = 128, 61.2%) reported “probably yes” to attending anthropometry training. Similar proportions of acute (63%) and community (59%) dietitians reported that they would be likely to attend training. Qualitative analysis indicates that the most common reasons were:

- development of skills and/or knowledge (n = 20, 9.6%);
- as an update or refresher (n = 29, 13.9%);
- to improve confidence and/or competence (n = 52, 24.9%).

Fifty one (n = 51, 24.4%) of responders reported that they would “probably not” attend future anthropometry training, with slightly higher rates of community dietitians (30%) compared with acute dietitians (22%). Qualitative analysis revealed the most commonly reported reasons were: already trained (e.g. PENG, ISAK) (n = 8), have received sufficient on the job training/happy with own skills (n = 9), would not change practice/affect patient care (n = 2) and not relevant to job/role/not priority/for research (n = 27). It should be noted that many of those reporting that further anthropometric training would not be relevant to job/role also indicated working within weight management, paediatrics, critical care and community settings (however, these jobs do involve anthropometric measurement use).

Twenty nine (n = 29, 14%) respondents reported that they may consider further training in the future, with slightly higher rates of acute (15%) compared with community (11%) dietitians (**figure 25**).



**Figure 25: Percentage of dietitians indicating interest/decline for future training by area of work (n =209)**

In summary, there was a significant difference between area of work and training received: acute dietitians appeared to have received more training at university and on external courses than community dietitians. More community dietitians appeared to have received training 'on the job'. The majority of all responders would attend future anthropometric training, with slightly greater numbers of acute dietitians than community responders.

## 4. DISCUSSION

### 4.1. Summary of findings

The aim of this study was to investigate the use of and barriers and attitudes towards using anthropometric measurements by NHS dietitians in the North West of England. For this, a questionnaire assessing anthropometric use, barriers and attitudes was designed, piloted and validated amongst a sample of 32 dietitians.

Analysis of confidence scales indicated that the VAS was comparable to Likert, in terms of sensitivity and reproducibility, hence supporting the use of the VAS as a tool for assessing confidence when taking anthropometric measurements by dietitians.

The primary, null, hypothesis was that there would be no significant differences in the type, frequency of, and attitudes/barriers towards, anthropometric measurement use between community and acute working dietitians.

A summary of the findings include: a response rate of 54% (n=213) was achieved, 140 (65.7%) of which were acute and 73 (34.5%) community based; and 6.1% (n=13) were male. The majority of responders were qualified >1-5years (n=81, 38%), reported being band 5-7 (n=186, 87.5%) and were in full time employment with the NHS (n=173, 81.2%). Over half of responders reported working within nutritional support (n=117, 55%). The most commonly used nutritional screening tool was 'MUST' (n=146, 54.7%). The use of 'MUST' was statistically significantly higher amongst acute compared with community dietitians (n=87 vs. 59 respectively; p<0.05). Highest confidence ratings were for BMI, height and weight, and lowest for BodPod and head circumference, with significant differences between groups' average, overall, confidence scores (community: 54.21  $\pm$  14.78mm; acute: 60.27  $\pm$  12.11mm; p<0.05).

The majority of anthropometric measures were reported to be taken on an infrequent basis ('Never'/'Less than monthly'). Height, weight, BMI were most commonly used; especially recalled/estimated, which were both statistically different between groups ( $p < 0.05$ ), with acute responders using more frequently than community responders.

The most prevalent barrier was 'Not appropriate for patient', followed by 'Lack of equipment' and 'Time/work load constraints'. Significantly more acute responders reported 'Time' (81.4%) and 'Confidence' (75.5%) to be barriers to anthropometry use. The majority of responders (84.9%) reported receiving anthropometry training at university: with a significantly ( $p < 0.05$ ) higher proportion of acute (90.7%) than community (73.6%) dietitians; similarly, more acute (28.6%) compared with community (13.9%) responders reported receiving external courses on anthropometry ( $p < 0.05$ ). One hundred and twenty eight (61.2%) of dietitians reported a preference to attend future anthropometry training, primary reasons being to increase confidence and competence.

## **4.2. Validation study discussion**

The Likert scale is a commonly used scale applied to assess thoughts, attitudes and preferences (Likert, 1932 cited in Bartoshuk et al., 2004). It is a scale that is able to assess one's level of agreement with a sentence. It is thought to be simple to replicate to many scenarios and easily understood and completed by participants. This scale generates data which is easily interpreted and analysed due to the use of categorical data with only 5 response options available. As aforementioned in the introduction, this 'ease of use' can however also be a limitation, offering responders a limited 1 in 5 option scale, decreasing its' sensitivity. Continuous (linear) scales such as the 100mm VAS offer greater choice of answers so increases sensitivity and do not assume each responder perceives that interval gaps are of equal size; similarly by not having several labels along the scale the responders' answer is not influenced. The General Label Magnitude Scale (gLMS) (Bartoshuk et al., 2004), a longer, vertical scale, allows sensations to be moderated or normalised, facilitating group comparisons, by having labels along the scale and an extreme, maximum label to allow sensations to be moderated. There may be however a greater error due to misinterpretation of the scale and confusion of how to use this (Cardello et al., 2003).

This study's analysis indicates that the VAS and the Likert scales, tested for attitude have similar sensitivity, with the VAS having a slightly smaller SD range, potentially indicating it as a preferred choice to assess confidence at taking anthropometric measures. Flint et al. (2000) suggested also that the VAS could be a reliable means of assessing appetite feelings. They similarly applied Bland-Altman analysis to test reproducibility, although accentuated that parameters and study power (sample size), need to be considered if VAS are to be used to asses appetite feelings.

On the other hand, the gLMS is not as commonly seen or used as the Likert and VAS scales, with anecdotal reports of difficulty to understand and use. The gLMS was originally designed and reported to be a valid tool to assess taste sensations, with the advantage of being able to compare responses amongst participants as labels are not proportionally displayed but based on actual feelings (Bartoshuk et al., 2004). The present study analysis revealed that the gLMS for confidence was the least sensitive tool to assess confidence at taking anthropometric measures of the three scales tested. Statistically significant differences ( $p < 0.05$ ) were detected in means [SEM] (VAS 55.1 [2.49], for gLMS 36.9 [2.54] and for Likert 55.7 [2.98]), a greater difference in mean scores with Likert (18.82) and a greater coefficient of reproducibility (44.5%) when using gLMS compared with Likert and VAS; meaning increased variability and reduced reproducibility of gLMS as a scale to assess confidence at taking anthropometry by dietitians. It must be considered, however, that gLMS may still be a sensitive tool (SD and SEM scores are comparable to the two other scales tested), but perhaps due to the extreme anchor labels results are biased to a lower mean – which has been interpreted via the tests applied within this study as lower sensitivity. The ranges of limits of agreement, in comparison to the commonly used Likert scale, were significantly smaller when using VAS compared with gLMS. This can be interpreted as showing that the Likert and VAS could be used interchangeably, namely due to comparable SD scores (Likert 16.8 and VAS 14.1). All three scales, however, do appear to be reliable, with scores falling within the British Standards Institution guidelines (1975) for repeatability, as 95% of scores fall within 2 SD of the mean limit when repeated tests were conducted.

In conclusion, VAS was thought to be a user-friendly tool, which was reliable and sensitive, thus selected as the tool to assess confidence at taking anthropometric measurements by dietitians within the main questionnaire design.



### **4.3. Main study discussion**

#### **4.3.1. Response rate**

A postal questionnaire was sent to all consenting NHS dietetic departments in the North West of England. The response rate to the questionnaire (54%, n = 213 out of the 397 questionnaires posted) exceeded expectations. Other survey based studies targeting UK dietitians have generated a response rate of ~30% (Burgess, 2003; McKenna et al., 2004; Whyand, 2007). The higher response rate of this study could be due to its robust methodology of piloting, short questionnaire with non-ambiguous questions, contact with departments via phone call and two reminder follow up contacts (Edwards et al., 2001; Smeeth & Fletcher, 2002; Streiner & Norman, 2008).

#### **4.3.2. Sample demographics**

More acute working dietitians, or those primarily based within a hospital setting, responded to the survey compared with those working within the community environment. This may be related to a large number of dietitians working within the hospital setting compared with community in this sample, or that community dietitians may be more difficult to target due to the nature of their job (non-fixed location) and may have more than one base. Despite this, statistical tests allowed for differences within group size, and results have been quoted as 'percentage within group' to allow for group comparisons.

Only six percent of responders were male which was expected; anecdotal evidence and experience indicates that the majority of HPC registered dietitians are female. NHS data also supports this, with figures for 2009 indicating that only 17% of all scientific, therapeutic and technical staff were male across the whole NHS (The health and social care centre, 2009). There was an equal distribution of male responders in both acute and community settings therefore it may be said that answers are unlikely to have been biased by gender trends (i.e. if males are more confident than females).

The survey was offered to all dietitians and dietetic assistants working in the North West of England in an NHS trust. The majority of responders reported being employed at band 5 to 7 level (i.e. newly qualified to specialist/senior specialist dietitians). It may therefore be assumed that the majority of responders are qualified and registered dietitians (i.e. not dietetic assistants). Dietitians are likely to be involved with patient face-to-face contact and are likely to perform nutritional assessments and monitoring of treatment plans as part of their everyday role. Hence, responders are likely to be aware of and/or use anthropometric measures (Baxter, 1999). Often those employed at band 8a or above are involved in managerial roles thus may have less exposure to patients and therefore it can be assumed that they may have less opportunity to take anthropometric measures.

Interestingly, there were more responders banded 3 and 4 (i.e. dietetic assistants, or non-registered dietitians) in the community setting. The job roles and responsibilities of this participant group are likely to differ across trusts. However, it may be possible that dietetic assistants are appropriately placed to monitor and review patients thus increasing their exposure to anthropometric use hence involvement within the current study was encouraged. Conversely, due to possible variations in training provision this participant group may not use and/or are not confident at taking anthropometry. More detailed exploration of this was beyond the scope of this work.

Porter et al. (2009) recently considered factors that impact on nutritional screening occurrences, namely workload, uncertainty of the nutrition policies and individual skill in using suggested screening tools. Albeit a small study using quantitative data (retro- and prospective counts of patient nutrition screening rates) and qualitative data (convenience sample of 18 staff nurses in a focus group) it highlighted that staff nurses and/or nutrition assistants are ideally placed to conduct simple screening tools

that often involve height, weight and BMI measures across all patient groups. Dietitians are then able to apply more complex assessment, perhaps including other anthropometric tools e.g. grip strength, skin folds, circumferences and/or ratio measures which are likely to detail a dietetic assessment including nutritional requirement calculations (Gibson, 2005).

Over half of responders were involved with providing nutritional support therapy to patients. This patient group is likely to be malnourished, or at risk of malnutrition (NICE, 2006, BAPEN, 2008a). It is logical therefore to assume that NICE (2006) guidelines for nutritional support in adults are known to the majority of responders. NICE guidelines detail the use of anthropometry within this patient group. Guidance includes the recommendation for daily weights, BMI to be calculated on the initial assessment and monthly thereafter and the use of MAC and triceps skin fold on a monthly basis should measured weights be unobtainable. Indeed, their description of malnutrition itself involves the use of BMI (thus weight and height) and percentage weight loss (i.e. repeated measurements of weight over time).

Despite this, MAC and triceps skin folds were not reported as being conducted on a frequent basis amongst our sample of dietitians. Perhaps the dietitians sampled are relying on estimated or recalled information from the patient, friends, family members, more than on measured weight or alternative objective measures such as MAC and triceps skin folds. This is supported by recalled weight and height being reported within the top 5 'daily' used measures for both community and acute responders and by 'lack of time' also being a highly prevalently chosen barrier. There is, however, a lack of literature available regarding frequency of use of anthropometry and use of measured vs. estimated anthropometry available to support this finding.

#### 4.3.3. Screening tools used

'MUST' was reported as the most commonly employed nutrition screening tool, not surprisingly due to its validity, reliability and ease of use (BAPEN, 2006). 'MUST' is a well publicized screening tool with training literature being available to aid its role out into trusts across the UK (BAPEN, 2006). 'MUST' also provides details on appropriate surrogate measures of weight and height such as knee height, ulna length, demi-span and MAC, to ensure objective data are used to screen patients as accurately as possible. It would, therefore, be logical to predict that these surrogate measures, as well as height, weight and BMI would be routinely used by dietitians. Despite this neither community nor acute responders reported using knee height, ulna length, demi-span or MAC on a frequent basis. No responders reported using knee height daily, 1 responder(s) reported demi-span, ulna length and MAC use daily, with weekly use ranging from 2-22 responders for these methods. All of these methods were most prevalently rated as 'Never' used. These measurements are of course more time consuming and more difficult to perform (Gibson, 2005). Seven participants reported that they do not use a screening tool; it is possible that this is due to lack of awareness of local policy (Porter et al., 2009), or it not being a priority or part of their job role. It is possible that if a nutritional screening tool is not employed, anthropometry is not likely to be part of routine assessment.

#### 4.3.4. Barriers and confidence towards anthropometry

Based on the alternative hypothesis that there is a difference between acute and community working dietitians' perception of barriers towards anthropometric use, it was predicted that confidence levels would significantly impact on anthropometry use thus act as a barrier. A 100mm visual analogue scale (VAS) was thus employed to explore confidence rating of responders when taking such measures.

Descriptive statistics and  $\chi^2$  analysis suggested that there was a significant difference between average confidence scores for community ( $54.2 \pm 14.8\text{mm}$ ) and acute ( $60.3 \pm 12.1\text{mm}$ ) participants, with community reporting lower confidence scores.

Interestingly, community responders did not perceive lack of confidence as a barrier towards anthropometry as highly as their acute working colleagues. Community responders ranked nine other barriers higher than “perceived lack of confidence” whereas the acute group rated just five other barriers higher, such as ‘do not need to’ and ‘lack of equipment’.

It should also be noted in conjunction with the above that community responder’s frequency of use of anthropometry was rated on average lower than acute responders’. However, we have not been able to answer whether it is their low confidence that impacts on frequency of use, or if it is other barriers such as lack of equipment, case load and training that reduce frequency of use and consequently confidence diminishes due to lack of familiarity with the measures. It appears that although confidence is not the highest rated barrier to taking anthropometric measurements it is still a significant factor; since the majority of responders both community (59% within group) and acute workers (63% within group) reported that they would be likely to attend anthropometric training in the future. The most commonly reported reasons for attending further training were to improve competency and to improve confidence.

For all responders estimated, recalled weight and height and BMI calculations received the highest rating of confidence; this can also be seen when considering frequency of use across the whole sample group. It may be argued however that these are not anthropometric *measurements* as they do not require physical measurement of body size (Gibson, 2005) and are easier to take than actual

anthropometric measurements. This would suggest that, typically, the dietitians sampled are not using *any* physical anthropometric measures routinely within day to day practice. Although literature searches failed to find other studies considering anthropometric use by dietitians specifically, it is recognised that estimated or recalled measures are a frequently encounter. A large systematic review was conducted by Gorber et al. (2007). It included 64 studies of observational and experimental design, published between 1979 and 2005. Each study included between 44 and 16,000 patients aged 10 – 89 years, with the majority being >18years. By comparing self reported and measured data Gorber et al. showed that weights and BMIs are often underestimated and heights overestimated by varying amounts between gender and within study design. It was suggested that if a correction factor was applied estimates or recalled figures could be used, when measured data are not available, (Gorber et al., 2007) as the inherited error in recalled data would be reduced, potentially improving calculations and assessments that take place thereafter.

Head circumference and BodPod were rated with the lowest levels of confidence of all the measures questioned across the sample. This may be due to lack of equipment. BodPod is often used in research or for academic purposes only and is expensive, therefore it would not be expected that many responders, especially if not involved within research, have seen or used such method. Similarly head circumference is used as an indicator for growth within babies and infants, thus for those responders not working within paediatrics, confidence levels are expected to be low. Also, head circumference may be taken by other health professionals, such as midwives, doctors and public health nurses/visitor, (Chiabi et al., 2008; Thomson et al., 2009) prior to dietetic involvement.

Statistically significant differences between community and acute participants' confidence scores were seen for skin fold, MAC, demi-span, knee height and head circumference measurements. These measurements all require skin fold calipers and/or tape measures and a degree of skill (Gibson, 2005). Community dietitians may lack needed equipment hence explaining, in part, the differences in confidence scores (BAPEN, 2008a) and lack of use of such measures. Measures requiring equipment have a cost implication and when considering infection control policies (i.e. need for single use equipment) provision of equipment may be a limiting factor. It may be argued though that weighing scales may be viewed in the same way contradicting this argument when considering that the majority of responders reported using measured weight on a daily or at least weekly basis (96% of acute and 88% of community responders). Weights, however, are often needed for medical interventions and the provision of scales may be seen more as a necessity than skin fold calipers and other specialist equipment.

The most commonly chosen barrier to anthropometry use was 'not appropriate to patient'. The range of responders (i.e. dietitians and assistants all with varying experiences, specialties, work location, bandings) completing the survey and the range of anthropometric measures available may have influenced this result. Often measures are patient or situation specific, therefore, do not apply to all. For example, it would often be impossible for critical care dietitians to assess hand grip strength (Baxter, 1999); those working solely with adults would not use percentile measures, length or head circumference, nor would paediatric dietitians use height with babies/infants. Use of anthropometry may depend on a patients' clinical condition and may provide rationale for low anthropometric application rates (Bunting & Weaver, 1997).

It has been documented that understanding, knowledge, equipment provision, accuracy of equipment and skill are potential inhibitors toward anthropometry use (Baxter, 1999). Within the present study the second most prevalently chosen barrier was 'lack of equipment'. This supports BAPEN's *Combating Malnutrition: Recommendations for Action* (2008) paper which recognises that resources are a barrier to nutritional assessment and the provision of equipment is needed to allow for accurate, detailed and objective assessment. This superseded the King's Funded report which recommended that all wards and clinical areas should have access to devices to assess weight and height (Lennard-Jones, 1992). Interestingly it seems that the sampled dietitians did not perceive the problem of equipment as prevalently as it may be. 'Lack of *accurate* equipment' was rated as a barrier for only 3.5% of acute and 3.2% of community responders, overall rating this as the 11<sup>th</sup> most prevalent barrier to anthropometry use out of the 15 barriers questioned. This may indicate that the equipment that is available is appropriate and maintained. This is in support of a small equipment survey across 12 wards and 14 out-patient areas in one hospital in Glasgow, which revealed that 82% of weighing scales and 43% of height equipment were within specified accurate limits (Bunting & Weaver, 1997).

The third most prevalently chosen barrier differed between acute and community responders, with 'Do not feel I need to' being indicated as a barrier for 12.3% of community responses and 7.9% for acute. Interestingly, it may be reasonable to consider anthropometry to be of more use and importance within the community setting when considering the lack of other objective markers (e.g. biochemistry, which are often not readily available to community dietitians). However, there may be a level of ambiguity with this question and it may have been interpreted interchangeably with 'not appropriate for patient' which is recognised as a limitation within the present study's questionnaire design. If it is assumed, however, that it has not been misinterpreted it may suggest that responders do not see anthropometry taking as



part of their job role or that these data would not further improve their assessment. According to the literature dietitians are vital in the role of complex patient nutritional assessment, which typically involves the use, interpretation and evaluation of dietary, biochemical, functional *and* anthropometric data (Baxter, 1999; Gibson, 2005). The literature fails to detail who should be taking anthropometric measures. Dietitians are able to interpret and evaluate biochemical data, although are not suggested to be qualified phlebotomists. If anthropometric measurement taking is perceived in the same way, further research is vital as negative attitudes of staff nurses have been recorded towards anthropometric use (e.g. weight, height, BMI calculations, nutritional screening paperwork). Porter et al. (2009) explained this in part due to lack of understanding, knowledge and time demands as well as a perception that this is not within *their* role but that of a dietitian – suggesting ambiguity over anthropometry responsibility.

The third most prevalently chosen barrier for acute dietitians was 'time constraints/work load' (11.7% acute vs. 8.4% community,  $p>0.05$ ). This was also recognised as a barrier to nutritional assessment and compliance with NKF-K/DOQI renal guidelines by American dietitians surveyed over 5 years ago (Burrowes, Russell & Rocco, 2005). A 49-question survey was completed by 848 dietitians (50% response rate). Dietetic working in the USA may not directly be comparable to dietitians in the North West of England, and within the NHS specifically, and only renal dietitians were requested to consider their compliance with guidelines and not anthropometry per se. However, its findings suggest similar barriers such as resources (e.g. lack of calipers [57%]) and high workloads (40%) as substantial barriers to dietetic assessments as found within the present study.

NICE guidelines (2006) detail that “height, weight and other anthropometric measures may be perceived by patients as an invasion of personal space and should be recorded for future reference to reduce unnecessary repetition”. Private or partially screened assessment areas were suggested by Himes (2009) to minimise emotional upset when taking anthropometric measurements in children. Despite these recognitions, the current study indicates that dietitians’ perceptions disagree in practice: the barriers ‘patients do not like it’ and ‘too invasive’ accounted for just 3.3% and 5.6% of all responses respectively, rated as the 12<sup>th</sup> and 8<sup>th</sup> most prevalently chosen barriers out of the 15 questioned. Similarly, the majority of responders (43.9% of the whole sample) disagreed with the statement that ‘invasive’ anthropometry is a barrier to consultations. Equal proportions of responses were noted for those agreeing (35.8%) that patients do not like invasive measures and those opposing this view (34.4%). This indicates that the infrequent use of anthropometry is unlikely to be due to patient refusal.

#### 4.3.5. Frequency of use

The null hypothesis, that there is no difference between area of work and frequency of use of anthropometric tools was rejected for estimated and recalled weight only. Weight, height and BMI were found to be the most commonly used measures; with over 70% of acute responders using estimated weight on a frequent basis (“at least weekly”/“daily”) compared with 38% of community responders. Recalled weight was also reported to be used on a frequent basis by more acute (76%) responders than community (36%) responders. One must again consider if this is due to differences in equipment provision, and therefore, alternatives to measured weight must be employed. Exploration into potential barriers indicated that ‘Lack of equipment’ was rated as the second most prevalent barrier to anthropometric use by both acute and community responders, secondary only to “not appropriate for patient”, confirming the role of equipment provision.

Work load/time constraints was rated as a barrier by proportionally more acute responders (11.7%) than community (8.4%). This may be due to differences in work roles and/or responsibilities; speculation also suggests that community based dietetic therapy may allow for more time per consultation, thus more time for measurements to take place. It may therefore be surmised that those working within the acute setting are likely to value the need for measured weights although do not have the time to conduct these measures hence use estimates as a surrogate. This is supported with the responses to the attitude questions – the majority of all responders agreed or strongly agreed with the statements that anthropometry is part of the unique role of a dietitian and is essential when monitoring patients and forming part of the nutritional assessments. Positive attitudes were also seen with the majority of responses indicating that other measures are needed in addition to weight, and that over 50% of responders reported that it was insufficient to use estimated or recalled weight. Perplexingly, within the attitude questions lack of training, equipment, nor time were rated as the 'greatest downfall to anthropometry use' by the majority. Indeed, approximately equal proportions of responders agreed and disagreed with each statement. This suggests potential barriers are not universal or that a number of barriers inhibit anthropometry use with a cumulative effect.

#### 4.3.6. Attitude towards anthropometry

Attitude questions were included within the survey to explore thinking towards certain ideas as well as to consider the null hypothesis that there is no difference between area of work and attitude towards anthropometry. Based on mean attitude scores for all questions the null hypothesis can be accepted; mean attitude scores were not statistically different for acute ( $38.6 \pm 5.2$ ) and community ( $39.3 \pm 6.1$ ) responders. In general there was a slight skew towards positive attitudes for anthropometry used for the study sample; acute dietitians had a greater positive attitude than community.

#### 4.3.7. Training

Less than half of all responders reported receiving anthropometry training outside the university environment, potentially highlighting a gap in dietetic training. Surprisingly, we found a statistically significant difference between area of work and where anthropometry training was received. All registered dietitians will have attended university, and area of work (i.e. acute/community) is not likely to have been determined by where training had been received in practice. It may be pertinent therefore to consider that a change to training/course content may have occurred over time, as slightly higher rates of more experienced dietitians (i.e. those with >10 years experience) reported working in the community setting. This can be supported when considering that only 89% (when discarding those graded < band 5 as dietetic university accreditation is not compulsory at this level) of responders reported being trained on anthropometry at university.

One percent of responders reported receiving no anthropometry training, perhaps accounted for by dietetic assistants, who were also encouraged to complete this questionnaire. These staff members do not require a university degree or dietetic training and unless they are provided with on the job training, and depending on their job role and responsibilities, this may not be indicated.

If those reporting 'no anthropometric training' were registered dietitians, explanations may include changes to training course content and/or poor quality or remembrance of training received.

Over half (61.2%) of all participants reported that they would want to attend further anthropometric training despite significantly fewer rating 'lack of training' as a barrier (9.7%). Slightly fewer community responders reported a likelihood to attend future anthropometry training. This may be linked to community responders having received sufficient training (community anthropometry training at university was significantly higher and 'lack of training' was deemed as a lower barrier compared with acute responses).

Byham-Gray et al. (2005) suggested that dietitians' implementation of evidence based practice (EBP) is greatly influenced by education levels, area or level of training, experience gained within the working environment as well as professional registration/associations. The survey included a comparable sample size and demographics to the present study (n = 258, male n = 8) and was completed by acute, ambulatory-care and 'other sector' dietitians to consider their knowledge, attitudes and perceptions of EBP. It similarly reported resources as one of the primary barriers, in this case to implementation of EBP overall. Byham-Gray and colleagues recognized that favorable attitudes towards EBP may not directly translate to practice. Our study also may suggest this: dietitians have reported positive attitudes to anthropometry yet frequency of use appears low. Byham-Gray et al. suggested that syllabus or course content changes must take place for dietitians to practically apply EBP – perhaps the same can be said for anthropometry.

In summary, the alternative hypotheses (H1) can be accepted; there is a difference between area of work (acute vs. community) in the frequency of use and barriers towards anthropometry use. Anthropometric measurements rated as being taken frequently, i.e. daily or less than weekly, were greater for acute than community workers. Significantly more acute dietitians used estimated and recalled weights ( $p<0.05$ ). Significantly fewer community responders viewed time/work load (8.4% vs. 11.7%) and lack of confidence (3.9% vs. 7.6%) as barriers to anthropometry use compared with acute dietitians ( $p<0.05$ ).

Although there also appeared to be slightly greater positive attitudes towards anthropometry by acute than community dietitians, further exploratory studies should be conducted in order to statistically accept or reject the H1 regarding attitude.

One must, therefore, consider if job roles differ significantly and if in general anthropometry is not deemed as a significant part of a community dietitian's role compared with those working within a hospital setting.

#### **4.4. Study strengths and limitations**

This project's limitations, as with all self-completed questionnaires, included the provision of socially desirable answers, lack of opportunity to provide prompts or probes to answers as well as inability to gather additional data.

However, low interviewer effects/bias and no interviewer variability as well as greater convenience to responders were advantages (Bryman, 2001). To ensure that results were as valid and as low in responder bias as possible phrasing and design of questions were carefully considered. The main study questionnaire was amended following a pilot, within which the questions were confirmed as being clear, concise and not ambiguous. To avoid "respondent fatigue" the number of questions included was limited (Edwards et al., 2001).

Techniques such as keeping the length of the questionnaire short, providing self-addressed (freepost) envelopes, contacting participants prior to distribution of the questionnaire and offering additional copies of the questionnaires during the 2 follow-up contacts probably enhanced response rate (Edwards et al., 2001; Smeeth & Fletcher, 2002; Streiner & Norman, 2008). The response rate of 54% is substantial for a survey based study, however it is recognised that those that took time to complete the survey may have substantial/specific views on anthropometry use, and we are unable to consider the answers of those who failed to respond.

Similarly, we were unable to consider gender differences as only 6% of responders were male. A larger sample size, or targeting male dietitians across the UK specifically, would be needed for this exploration. A larger sample size may also overcome the limitation of violation of  $\chi^2$  assumptions. Tests that violated these assumptions within this study were discounted from statistical analysis with trends considered only, hence a limitation of this study.

In this study there were slightly higher numbers of community responders working part-time than full time. One must consider if reduced working hours would impact on the frequency of anthropometric use and if this reduced frequency of use, impacted on confidence levels at taking such measures or vice versa. It is a limitation of this paper to have not considered the number of hours employed in relation to the frequency of anthropometry use, as this may be a confounding variable. It may have been more applicable, therefore, to have considered 'what proportion of time in your job role do you spend in face-to-face contact with patients?'

Similarly, it may have been pertinent to have re-phrased the term 'Daily' when considering frequency of use as a response. Given the nature of the job and differences in patient need/requirements of a community dietitian, patients are not seen as frequently as with acute dietitian's case load of patients. This may have resulted in the interpretation of 'Daily' being varied between responders. It may have provided more clarity and less ambiguity, to allow for improved comparison of answers, to have used "on each face-to-face contact with a patient" rather than "daily".

Literature reviews revealed that previous surveys/questionnaire based studies that involved dietitians as the sample population had varying sample sizes from 127 (Whelan, 2007) to 500 participants (Taylor, 1998); and piloting surveys included just 20 randomly selected participants. A study by Nelson in 2007 involved 228 questionnaires sent to dietitians via the Regional Dietetic Managers group of the BDA across 14 regions (i.e. nationally over the UK) producing a response rate of 38%. Healy's (2002) cross sectional study distributed surveys amongst 345 participants of the Irish Nutrition and Dietetics Institute (i.e. 100% of whole sample population) gaining a 44% response rate. This study reports piloting the survey



initially on “a small sample of both community and acute dietitians” (specific number of participants were not detailed). Most survey studies failed to detail information on sample size calculations, although Harrison (2001) reports that his sample of 220 (from 40 departments) represented all departments/trust/regions of the UK; 140 questionnaires were returned and it was commented that this generated a greater response rate than the previously achieved 30% by the BDA Member’s Attitudinal Survey of 1998. A response rate of >50% was obtained in the present study, which highlights strength of this study in terms of sample size and response rate.

A substantial strength of this present study is the piloting and validation process that was employed. The questionnaire was deemed to be clear and unambiguous. The validation process allowed for the involvement of the most appropriate scale tool to be incorporated within the main study. Albeit using a small sample size ( $n = 32$ ), it was sufficient for statistical analysis, it is thought that this provides the first research of its kind at validating (considering sensitivity and reproducibility) a confidence scale for use when assessing dietitians use of anthropometric measurements.

As an observational study, this project does not prove cause and consequence but provides cross-sectional data on current trend, insight into current dietetic and anthropometric practice and does not intend to claim causation.

#### **4.5. Implications for practice**

From the data presented in this work it is hoped that dietitians may reflect on their own role and practice, e.g. they may consider their frequency of anthropometric use and reasons behind this. Dietitians may wish to extend their knowledge via reading, CPD activities and/or increase practical experience to improve anthropometric use in practice, thus enhancing patient care by providing detailed, informed and holistic dietetic assessments.

Discussions within dietetic departments to consider ways of reducing inhibitors to anthropometric use may prove helpful. For example, adapting documentation to ensure anthropometric measurements are taken and recorded clearly as well as considering budgets for equipment provision in line with guidelines such as BAPEN (2008) and the King's Funded Report (1992).

The present study highlighted discrepancies and potential deficiencies within dietetic training. It may be suggested that a common approach to anthropometric training is needed (Byham-Gray et al., 2005); such as university courses becoming regulated for a common training approach or 'accredited courses' being incorporated within syllabuses to equip newly qualified dietitians with additional qualifications and knowledge. Alternatively, training sessions within the work environment (external accredited or peer reviewed) may help increase dietitians' understanding and competency and, therefore, confidence of anthropometric measurement technique; as well as to provide support to other health professionals to ensure accurate and timely nutritional screening.

This paper may also provide support into the use of VAS as a tool to assess and monitor confidence when taking anthropometric measurements; this may be of use should the above point be implemented within departments or within similar areas of research. VAS may also be of use as an attitudinal scale beyond the confidence remit for dietitians and potentially other health professionals e.g. nursing staff confidence when taking anthropometric measurements or dietitian's attitude towards new guidelines.

#### **4.6. Future research possibilities**

The present study described the trends in attitudes, barriers and use of anthropometry by dietitians in the North West of England. However, due to limitations within the study (i.e. time scale, scope, limited sample sizes within sub-groups) as well as by raising further questions for debate, it may be of interest to consider:

- Replicating a similar study across other areas of England, internationally and/or beyond the NHS.
- The practical use of anthropometry and/or nutritional assessments compared with guidelines, such as NICE (2006), via observational studies and/or audit.
- More stringent ways of considering anthropometric use e.g. retrospective count of frequency of use from patient notes rather than questionnaires.
- The length of time required to perform various anthropometric measurements, and whether this practically applies to a typical dietetic consultation time allocation.
- How accurate dietitians are at actually estimating parameters such as height and weights and the implications on nutritional assessment and treatment outcomes.
- Anthropometric use from the patients' perspective.
- Whether perceived *competency* levels are more closely related to frequency of anthropometry use than confidence.
- The impact that various forms of anthropometric training could have on outcome measures i.e. does training improve measurement accuracy and use.
- Whether trends found (i.e. frequency of use and confidence levels) differ within sub-groups e.g. level of experience. This could be expanded to an exploration of differences in use of more recently developed or computerised anthropometric measures (e.g. BIA, BodPod) with level of experience.

## 5. CONCLUSIONS

The main findings from this study include:

- Anthropometric measurements appear to be taken infrequently by dietitians in the North West, particularly measures that could be described as requiring advanced skills and technique.
- Estimates were being more commonly employed, although by varying degrees between acute and community dietitians.
- Numerous barriers were apparent, potentially explaining the low anthropometric use rates. The most prevalently indicated barriers for the sample as a whole were 'not appropriate for patient' and 'lack of equipment'. However, significantly more acute responders reported 'lack of time', and more community responders rated 'do not need to' as barriers to use; raising the question of whether significant differences are apparent between acute and community dietitians' roles.
- Responders indicated an overall positive trend towards anthropometry use. There was no statistically significant difference between acute and community responders for attitude.
- This study indicates that dietitians receive various degrees of anthropometric training. The majority of responders would choose to attend further training with confidence being a main motivation. This may reflect perceived or real weaknesses within many dietitians' competencies and deficiencies within dietetic training.

This study also supports the use of VAS scales when assessing dietitians' confidence at taking anthropometric measurements. This tool has been found to be sensitive and reliable compared to Likert, providing support for VAS use when assessing attitude, towards a particular task.

It is recognised that observational studies (i.e. cross-sectional survey in this case) can only indicate association; it is therefore hoped that this study has explored and suggested reasons for trends in anthropometry use as well as highlighting weaknesses within the anthropometry research and dietetic training field.

In conclusion, regardless of the importance or reported benefits of anthropometry, it is performed to a very limited degree by dietitians in the North West and is often limited to estimates, BMI, heights and weights only. The reality of the job of an NHS dietitian leaves very little time for sophisticated measures that ideally should be performed (Gibson, 2005). It should, therefore, be considered whether it is realistic to expect many anthropometry measures to be used and whether training reflects the reality of practice. Despite this, the mastery and utilisation of anthropometric measurements has the potential of promoting the role of dietitians and could be seen as a unique skill in this profession. It is hoped that dietitians will reflect on their own practice, to consider if and/or how anthropometry use could benefit patient care and enhance nutritional assessments.

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Secondary Citation:

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## **7. APPENDICES**

### **7.1. Appendix 1: Questionnaires:**

- Pilot study questionnaire with validation questions
- Validation questionnaire: scales to assess confidence booklet
- Main study questionnaire, with cover letter and PIS.

Department of Biological Sciences  
University of Chester  
Parkgate Road  
Chester  
UK  
CH1 4BJ

Dear Colleague,

**DETERMINANTS OF ANTHROPOMETRIC MEASUREMENT USE  
AMONGST DIETITIANS**

You have been selected to take part in a Pilot Study for my Master's thesis.

Part of my thesis is to investigate dietitians' use and views of anthropometry in practice via a questionnaire. This shall be offered to all dietitians across the North West of England. Questionnaires shall be statistically analysed comparing results from various specialties (e.g. weight management vs. diabetes) and area of working (i.e. community vs. acute dietitians).

It is hoped that this research project will provide evidence in to the practical use of anthropometry and potentially enhance training where necessary. Results may also recommend future research in related areas.

**Please note the following instructions:**

Please note that that following Participant information sheet and 13 questions are what participants in the final version of the questionnaire will receive.

1. Please note the length of time taken to complete the questionnaire, and record this where requested within the "Pilot Study Questions" section.
2. Please complete all 13 questions within the questionnaire.
3. Then please spend a few minutes completing the 'Pilot Study Questions' that follow the main body of the questionnaire which ask for feedback relating to the layout, format, wording and content of the questionnaire.
4. Please submit all following papers in the pre-paid envelope provided, by the **22<sup>nd</sup> November 2009.**

If you have anything to discuss further with me surrounding this topic, questionnaire or research project please do not hesitate to contact me on:

[0200644@chester.ac.uk](mailto:0200644@chester.ac.uk) or 0161 212 4038.

**Thank you for your time and input in to this study, it is very much appreciated!**

**DETERMINANTS OF ANTHROPOMETRIC MEASUREMENT USE  
AMONGST DIETITIANS**

This survey asks a series of questions about dietetic practice and anthropometric use. There are no right or wrong answers and we would be very appreciative to hear your views.

If you would like to take part in the survey, which shall form part of a Dietetic Masters thesis, please complete the following questions.

This should take about \*\*\*\*minutes of your time.

Please return in the addressed envelope provided or to the following address:

FAO: Miss L Mash  
Student, MSc Nutrition and Dietetics  
University of Chester  
Department of Biological Sciences  
Parkgate Road  
Chester  
CH1 4BJ

**Thank you for your time**

## PARTICIPANT INFORMATION SHEET

### **“Determinants of Anthropometric Measurement Use Amongst Dietitians”**

**Dear Participant,**

I am conducting an audit into dietetic practical use of anthropometry. You are being invited to take part in this research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and use the contact details if you would like any further information. Thank you for reading this.

#### **What is the purpose of the study?**

To investigate community and acute working dietitians' use and views of anthropometry in practice.

#### **Why have I been chosen?**

You have been chosen as you are a registered dietitian/dietetic assistant working in the North West of England, employed by the NHS.

#### **Do I have to take part?**

It is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet to keep. If you decide to take part you are still free to withdraw at any time without giving a reason.

#### **What will happen to me if I take part?**

If you decide to take part, you will be asked to complete the questionnaire that follows, and return this to the researcher using the envelope provided which includes a free post address. By doing this you are giving your consent for the researcher to use your answers as part of the study findings. All information is anonymous and responses will not be identifiable within the final report.

#### **What are the possible disadvantages and risks of taking part?**

There are no disadvantages or risks foreseen in taking part in this study.

#### **What are the possible benefits of taking part?**

By taking part you will be contributing to the development of the dietetic practice and profession thus potentially benefiting patient care in the future.

#### **What if something goes wrong?**

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact: Professor Sarah Andrew, Dean of the Faculty of Applied and Health Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ. Tel: 01244 513055.

#### **Will my taking part in the study be kept confidential?**

All information which is collected about you during the course of the research will be kept strictly confidential so that only the researcher carrying out the research will have access to such information. We do not require your name or contact details which ensures confidentiality of responses and no information that could identify an individual will be used in the dissertation or in any publication, which may be written as a result of this research.

**What will happen to the results of the research study?**

The results will be written up and contribute to the completion of an MSc dissertation thesis for the University of Chester. Findings may also contribute to published literature. For either case no individuals will be able to be identified.

**Who is organising and funding the research?**

The research is funded by the department of Biological Sciences at the University of Chester. The Centre for Public Health Research at the University of Chester has reviewed the study protocol.

**Who may I contact for further information?**

If you would like more information about the research before you decide whether or not you would be willing to take part, please contact:

Laura Mash  
MSc Nutrition and Dietetics Student  
c/o Community Dietitian  
Sandringham House  
Castle Courts  
Windsor Street  
Salford  
M5 4DG  
Tel: 0161 212 4038

Dr. Eva Almiron-Roig  
MSc Supervisor  
Department of Biological Sciences  
University of Chester  
Parkgate Road  
Chester  
CH1 4BJ  
Tel: 01244 513124

**Thank you for your participation.**

## **QUESTIONNAIRE**

**1. Please indicate your main area of working\*. (Which ever you choose please answer the following questions in relation to your selection)**

- ☐ Acute (i.e. Hospital based *ONLY*)
- ☐ Mostly Acute
- ☐ Community (i.e. Any location that is non-acute or hospital based *ONLY*)
- ☐ Mostly Community

*\*n.b. this does not relate to employment but to actual place/area of working.*

**2. What screening tool does your trust employ (tick all that apply)?**

- ☐ A single measure (e.g. biochemical/anthropometric or functional index)
- ☐ Malnutrition Universal Screening Tool ('MUST')
- ☐ Mini Nutritional Assessment (MNA)
- ☐ Nutritional Risk Index
- ☐ Registered Nurses Nutritional Risk Classification
- ☐ Subjective Global Assessment (SGA)
- ☐ The Nursing Nutritional Screening Form (NNSF)
- ☐ The Prognostic Nutritional Index (PNI)
- ☐ None
- ☐ Own devised tool
- ☐ Own devised tool based on another published tool (please detail)

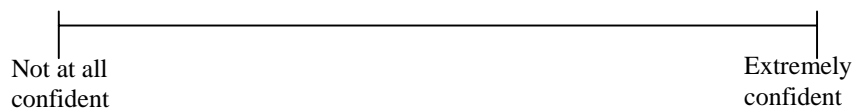
.....

- ☐ Other (please detail)

.....

**3. Please mark, with a trait (a vertical line), on the scale below how confident you feel at taking the following measurements:**

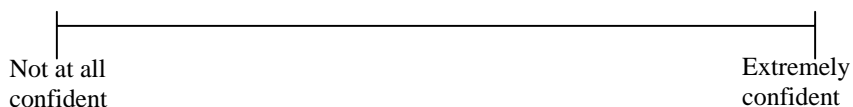
**a. A patient's Height**



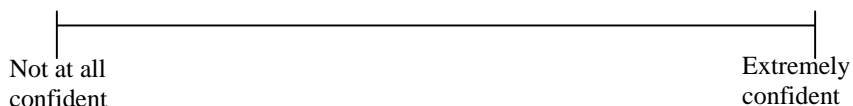
**b. A patient's Weight**



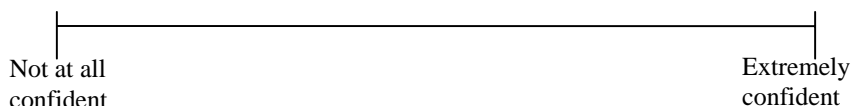
**c. Calculating a patient's BMI**



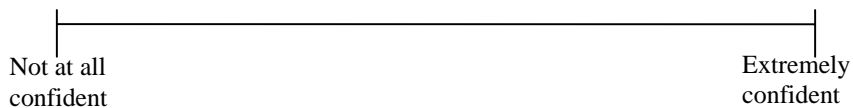
**d. A patient's Skin fold measurement**



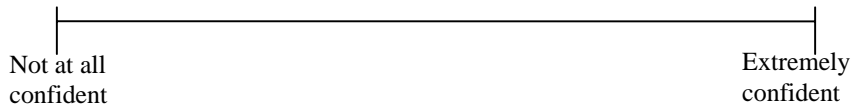
**e. A patient's Mid-Upper Arm Circumference**



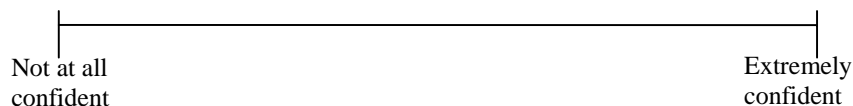
**f. A patient's Demi-span**



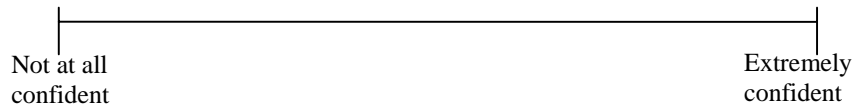
**g. A patient's Knee height**



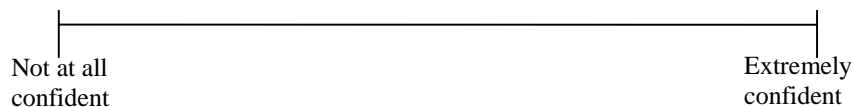
**h. An infant's Head circumference**



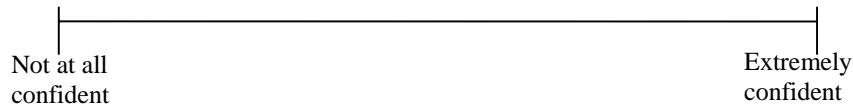
**i. A patient's Waist circumference**



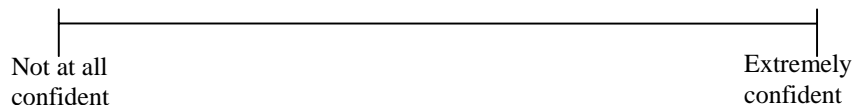
**j. A patient's Hip circumference**



**k. A patient's Waist to Hip ratio**



**l. Measuring body mass via BodPod**



**4. Please tick how often you use each of the measurements below when working as a dietitian or dietetic assistant:**

	<b>Daily</b>	<b>At least Weekly</b>	<b>At least Monthly</b>	<b>Less than Monthly</b>	<b>Never</b>
Measured height					
Estimated height from demi span					
Estimated height from knee height					
Recalled height					
Measured weight					
Estimated weight					
Recalled weight					
BMI					
Triceps skin-folds					
Other skin-fold measures					
Waist circumference					
Hip circumference					
Waist : Hip ratio					
Mid arm circumference					
BIA					
DEXA					
Length					
Head circumference					
Height : Age percentile					
Weight : Age percentile					
Height : Weight percentile					
Other/related measurements (e.g. Hand grip) please detail:					



**5. Please tick all the reasons that apply to why you may not take/measure anthropometric measurements:**

- ☐ Don't feel I need to
- ☐ Lack of competency/confidence
- ☐ Lack of evidence/not part of evidence-based practice
- ☐ Lack of necessary equipment
- ☐ Lack of training
- ☐ Not appropriate for patient
- ☐ Not required by departmental policy
- ☐ Patients do not like it
- ☐ Time constraints of consultations/work load
- ☐ Too invasive
- ☐ Other (please specify)

.....  
.....  
.....

**6. For the following statements (a – j) please tick your level of agreement in the boxes provided:**

	Strongly agree 5	Agree 4	Uncertain 3	Disagree 2	Strongly disagree 1
<b>a.</b> I believe anthropometry measurement taking is part of the unique role of a dietitian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>b.</b> I believe that nutritional screening is a necessity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>c.</b> I believe that BMI has very limited use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>d.</b> I believe that anthropometry forms a vital part of assessing a patients' nutritional status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>e.</b> I believe that other anthropometric measures are always needed in addition to body weight when assessing a patient status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>f.</b> I believe that skin fold measurements provide little additional information beyond weight alone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>g.</b> I believe that lack of equipment is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>h.</b> For me lack of training is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>i.</b> For me lack of time is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>j.</b> I believe that estimated or recalled weight is sufficiently accurate if actual weight is unobtainable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**7. What training have you received with regards to taking anthropometric measures, such as taking a patient's weight, height or triceps skin-folds? (tick all that apply)**

- ☐ During university course
- ☐ On-job training
- ☐ External course (please detail)

.....

.....

- ☐ None
- ☐ Other (please detail)

.....

.....

**8. Do you think professionally you would like to attend anthropometric training sessions/course?**

- ☐ Probably Yes – please indicate why:

.....

- ☐ Probably No – please indicate why:

.....

- ☐ Possibly in the future

**9. Please indicate your main area(s) of work at present (tick all that apply):**

- |   |  |
|---|--|
| <input type="checkbox"/> Cancer/oncology              | <input type="checkbox"/> Infectious conditions   |
| <input type="checkbox"/> Cardiovascular disease       | <input type="checkbox"/> Intensive/critical care |
| <input type="checkbox"/> Care of the Elderly          | <input type="checkbox"/> Liver disease           |
| <input type="checkbox"/> Cystic Fibrosis              | <input type="checkbox"/> Mental Health           |
| <input type="checkbox"/> Diabetes                     | <input type="checkbox"/> Metabolic Diseases      |
| <input type="checkbox"/> Eating disorder              | <input type="checkbox"/> Neuroscience            |
| <input type="checkbox"/> Food allergy/intolerance     | <input type="checkbox"/> Nutritional support     |
| <input type="checkbox"/> Gastroenterology             | <input type="checkbox"/> Paediatric              |
| <input type="checkbox"/> General medicine             | <input type="checkbox"/> Palliative care         |
| <input type="checkbox"/> Health Promotion             | <input type="checkbox"/> Renal                   |
| <input type="checkbox"/> HIV/AIDs                     | <input type="checkbox"/> Surgical                |
| <input type="checkbox"/> Home Enteral Tube Feeding    | <input type="checkbox"/> Weight management       |
| <input type="checkbox"/> Other (please specify) ..... |  |

**10. Please indicate your gender:**

- ☐ Male  
☐ Female

**11. Please indicate the number of years since you qualified as a registered dietitian/started work as a dietetic assistant:**

- |  |   |
|--|---|
| <input type="checkbox"/> 0 – 1 year    | <input type="checkbox"/> >10 – 15 years |
| <input type="checkbox"/> >1 – 5 years  | <input type="checkbox"/> >15 – 20 years |
| <input type="checkbox"/> >5 – 10 years | <input type="checkbox"/> >20 years      |

**12. Please indicate your current grade of working:**

- |   |  |
|---|--|
| <input type="checkbox"/> < or equal to Band 3 | <input type="checkbox"/> Band 6          |
| <input type="checkbox"/> Band 4               | <input type="checkbox"/> Band 7          |
| <input type="checkbox"/> Band 5               | <input type="checkbox"/> Band 8 or above |

**13. Please indicate the number of contracted hours you are employed to work in your current post for the NHS as a dietitian or dietetic assistant:**

- |   |  |
|---|--|
| <input type="checkbox"/> <10hours per week      | <input type="checkbox"/> >20 – 30 hours per week |
| <input type="checkbox"/> 10 – 20 hours per week | <input type="checkbox"/> >30 - 40 hours per week |

Thank you for your contribution
---------------------------------

## PILOT STUDY QUESTIONS

1. Please note the length of time it took you to complete the questionnaire (questions 1-13)  
below: .....
  
2. Do you think the questionnaire is -
  - ☐ too long
  - ☐ just right
  - ☐ too short
  - ☐ Any comments:  
 .....  
 .....  
 .....
  
3. Do you think that instructions/guidelines and purpose of the questionnaire (on the title page)  
are clear and understandable?
  - ☐ Yes
  - ☐ No
  - ☐ Any comments:  
 .....  
 .....  
 .....  
 .....
  
4. Please provide any suggestions or comments about:-
  - a. how you use/don't use anthropometry in day to day practice,
  - b. barriers towards anthropometry,
  - c. any personal views/preferences towards anthropometric measures.
 (Please note that these ideas may be incorporated as questions within **Question 6** of the  
questionnaire). .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....
  
5. Do any of the questions seem ambiguous, difficult to understand or misleading as to how to  
complete the question i.e. how many to tick, where/how to mark or provide answer etc?
  - ☐ Yes, please note question this relates to below
  - ☐ No
  - ☐ Any comments:  
 .....  
 .....  
 .....

6. Do you think the font type and size is suitable?

- ☐ Yes  
☐ No  
☐ Any comments:

.....  
 .....  
 .....  
 .....

7. Where space is left to complete “other” option or to enable the participant to provide further detail – do you think that there is enough room to write/complete responses?

- ☐ Yes  
☐ No  
☐ Any comments:

.....  
 .....  
 .....  
 .....

8. Would you change the order of any/all of the questions?

- ☐ Yes - please note which order you would place them in and why  
☐ No  
☐ Any comments:

.....  
 .....  
 .....  
 .....

Please provide any comments you wish to give about the questionnaire or research topic. ....

.....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....  
 .....

**Many thanks for your time and contributions towards this research project!**

## **VALIDATION QUESTIONNAIRE**

**Dear Colleague,**

Thank you for taking the time to complete the questionnaire and feedback questions.

As a subsidiary and final part of the current project please would you take the time to complete the following series of questions, there are 3 groups of questions. Instructions of how to complete each series of questions are provided in turn.

The following questions will take less than 5 minutes to complete.

As this is a validation study please write your name and address below (please note that your details will not be identifiable within any part of the study\*). If you are chosen to complete the validation study you will be contacted in the future, at one point only, to complete the questionnaire.

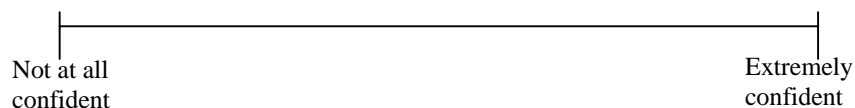
<b>Name:</b>	
<b>Address:</b>	

\*The above details will be converted into a code by the researcher to ensure anonymity: ☐ ☐ ☐ ☐ ☐ ☐

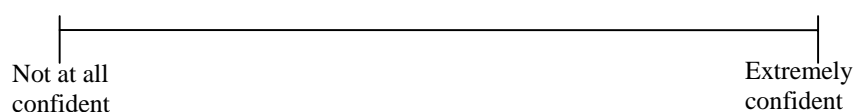
**Thank you once again for your time and co-operation.**

**1. Please mark, with a trait (a vertical line), on the scales below how confident you feel at taking the each of the following measurements:**

**a. A patient's Height**



**b. A patient's Weight**



**c. Calculating a patient's BMI**



**d. A patient's Skin fold measurement**



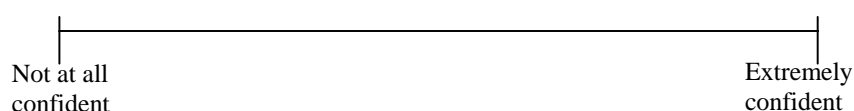
**e. A patient's Mid-Upper Arm Circumference**



**f. A patient's Demi-span**



**g. A patient's Knee height**





**h. An infant's Head  
circumference**



**i. A patient's Waist  
circumference**



**j. A patient's Hip  
circumference**



**k. A patient's Waist to  
Hip ratio**



**l. Measuring body mass  
via BodPod**



**2. On the following pages please mark with a horizontal mark across the scale to indicate how confident you are at taking the following measurements:**

**a. A patient's height**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**b. A patient's weight:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**c. Calculating a patient's BMI:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**d. A patient's skinfold measurement:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**e. A patient's mid-upper arm  
circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**f. A patient's demi-span:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**g. A patient's knee height:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident



**h. A patient's head circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**i. A patient's waist circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

Barely confident

**k. Calculating a patient's waist to hip ratio:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

# 1. Measuring a patient's body mass via BodPod:

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**3. Please place a tick in the relevant box for each question below,  
where 1 = strongly disagree through to 5 = strongly agree:**

***“I lack tools or knowledge needed to effectively measure/calculate my patient’s...”***

	Strongly disagree				Strongly agree
	1	2	3	4	5
<b>a. Height</b>					
<b>b. Weight</b>					
<b>c. BMI</b>					
<b>d. Skinfold measurement</b>					
<b>e. Mid-upper arm circumference</b>					
<b>f. Demi-span</b>					
<b>g. Knee height</b>					
<b>h. Head circumference</b>					
<b>i. Waist circumference</b>					
<b>j. Hip circumference</b>					
<b>k. Waist – to - hip ratio</b>					
<b>l. Body mass via BodPod</b>					

**Thank you once again for your time and co-operation!  
This completes the questionnaire**

**Determinants of Anthropometric Measurement Use Amongst Dietitians****VALIDATION QUESTIONNAIRE**

**Dear Colleague,**

Thank you for recently taking the time to complete the questionnaire and feedback questions on your use of anthropometry.

In order to complete the validation questionnaire please could you take the time to complete your name and address details below\*, and then complete the following series of questions, there are 3 groups of questions. Instructions of how to complete each series of questions are provided in turn.

Please submit all the pages in the pre-paid addressed envelope provided by the **30<sup>th</sup> December 2009**.

The following questions will take less than 5 minutes to complete.

<b>Name:</b>	
<b>Address:</b>	

\*The above details will be converted into a code by the researcher to ensure anonymity: ☐ ☐ ☐ ☐ ☐ ☐

**Thank you once again for your time and co-operation. This will complete your involvement in the present study and you will not be contacted again.**

1. On the following pages please mark with a horizontal mark across the scale to indicate how confident you are at taking the following measurements:

a. A patient's height

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident



**b. A patient's weight:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**c. Calculating a patient's BMI:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**d. A patient's skinfold measurement:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**e. A patient's mid-upper arm  
circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

Barely confident

**g. A patient's knee height:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**h. A patient's head circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**i. A patient's waist circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident



**j. A patient's hip circumference:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**k. Calculating a patient's waist to hip ratio:**

Strongest imaginable  
confidence

Very confident

Confident

Moderately confident

Mildly confident

Barely confident

**I. Measuring a patient's body mass via BodPod:**

Strongest imaginable  
confidence

Very confident

Confident

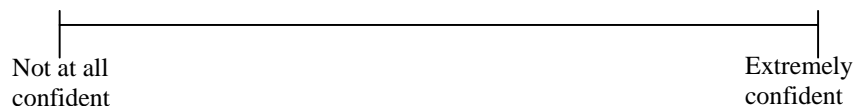
Moderately confident

Mildly confident

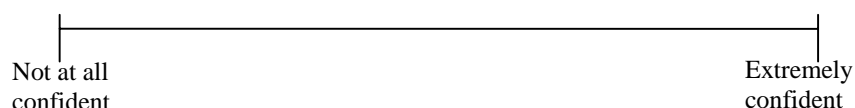
Barely confident

**2. Please mark, with a trait (a vertical line), on the scales below how confident you feel at taking the each of the following measurements:**

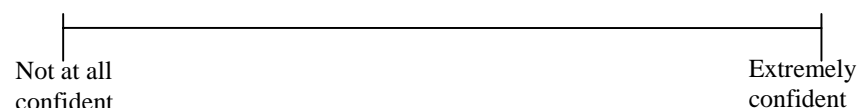
**a. A patient's Height**



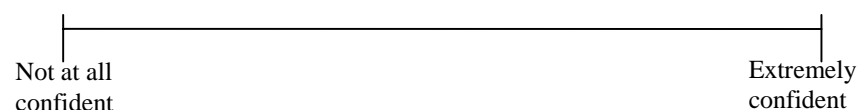
**b. A patient's Weight**



**c. Calculating a patient's BMI**



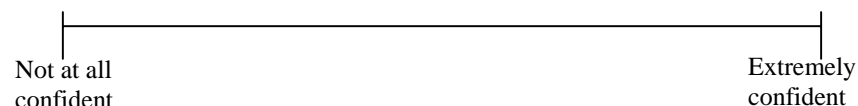
**d. A patient's Skin fold measurement**



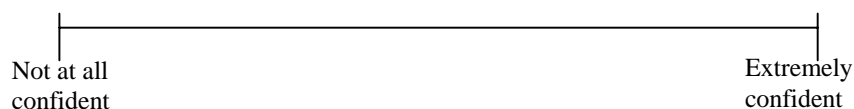
**e. A patient's Mid-Upper Arm Circumference**



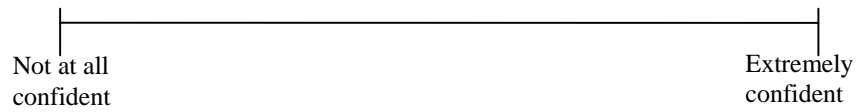
**f. A patient's Demi-span**



**g. A patient's Knee height**



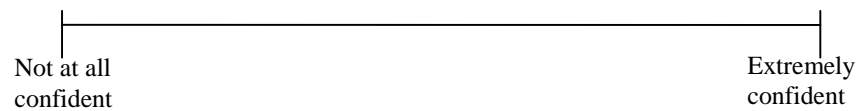
**h. An infant's Head  
circumference**



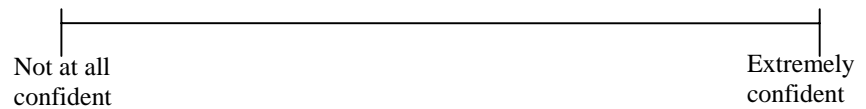
**i. A patient's Waist  
circumference**



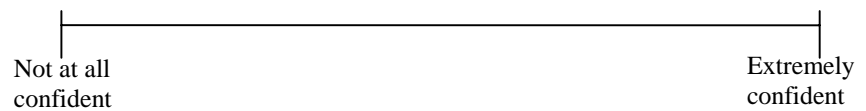
**j. A patient's Hip  
circumference**



**k. A patient's Waist to  
Hip ratio**



**l. Measuring body mass  
via BodPod**



**3. Please place a tick in the relevant box for each question below, where 1 = strongly disagree through to 5 = strongly agree:**

***"I lack tools or knowledge needed to effectively measure/calculate my patient's..."***

	Strongly disagree				Strongly agree
	1	2	3	4	5
<b>a. Height</b>					
<b>b. Weight</b>					
<b>c. BMI</b>					
<b>d. Skinfold measurement</b>					
<b>e. Mid-upper arm circumference</b>					
<b>f. Demi-span</b>					
<b>g. Knee height</b>					
<b>h. Head circumference</b>					
<b>i. Waist circumference</b>					
<b>j. Hip circumference</b>					
<b>k. Waist – to - hip ratio</b>					
<b>l. Body mass via BodPod</b>					

**Thank you once again for your time and co-operation!  
This completes the questionnaire**

University of Chester  
Department of Biological Sciences  
Parkgate Road  
Chester  
CH1 4BJ

March 2010

Dear Colleague,

**DETERMINANTS OF ANTHROPOMETRIC MEASUREMENT USE  
AMONGST DIETITIANS**

You have been selected to take part in a survey which forms part of an MSc thesis.

This survey asks a series of questions about dietetic practice and anthropometric use. There are no right or wrong answers and we would be very appreciative to hear your views. All answers will remain anonymous.

It is hoped that this research project will provide evidence in to the practical use of anthropometry and potentially enhance training where necessary. Results may also recommend future research in related areas.

If you would like to take part in the survey, please complete the following questions. This should take no longer than 10 minutes of your time.

Please return the questionnaire no later than **30<sup>th</sup> April 2010** in the addressed envelope provided or to the above address (FAO: Miss L Mash, Student, MSc Nutrition and Dietetics).

**Thank you for your time, it is very much appreciated!**

**Survey closing date: 30<sup>th</sup> April 2010**

## PARTICIPANT INFORMATION SHEET

### **“Determinants of Anthropometric Measurement Use Amongst Dietitians”**

**Dear Participant,**

I am conducting an audit into dietetic practical use of anthropometry. You are being invited to take part in this research study. Before you decide, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information and use the contact details if you would like any further information. Thank you for reading this.

#### **What is the purpose of the study?**

To investigate community and acute working dietitians' use and views of anthropometry in practice.

#### **Why have I been chosen?**

You have been chosen as you are a registered dietitian/dietetic assistant working in the North West of England, employed by the NHS.

#### **Do I have to take part?**

It is up to you to decide whether or not to take part. If you decide to take part you will be given this information sheet to keep. If you decide to take part you are still free to withdraw at any time without giving a reason.

#### **What will happen to me if I take part?**

If you decide to take part, you will be asked to complete the questionnaire that follows, and return this to the researcher using the envelope provided which includes a free post address. By doing this you are giving your consent for the researcher to use your answers as part of the study findings. All information is anonymous and responses will not be identifiable within the final report.

#### **What are the possible disadvantages and risks of taking part?**

There are no disadvantages or risks foreseen in taking part in this study.

#### **What are the possible benefits of taking part?**

By taking part you will be contributing to the development of the dietetic practice and profession thus potentially benefiting patient care in the future.

#### **What if something goes wrong?**

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, please contact: Professor Sarah Andrew, Dean of the Faculty of Applied and Health Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ. Tel: 01244 513055.

#### **Will my taking part in the study be kept confidential?**

All information which is collected about you during the course of the research will be kept strictly confidential so that only the researcher carrying out the research will have access to such information. We do not require your name or contact details which ensures confidentiality of responses and no information that could identify an individual will be used in the dissertation or in any publication, which may be written as a result of this research.



**What will happen to the results of the research study?**

The results will be written up and contribute to the completion of an MSc dissertation thesis for the University of Chester. Findings may also contribute to published literature. For either case no individuals will be able to be identified.

**Who is organising and funding the research?**

The research is funded by the department of Biological Sciences at the University of Chester. The Centre for Public Health Research at the University of Chester has reviewed the study protocol.

**Who may I contact for further information?**

If you would like more information about the research before you decide whether or not you would be willing to take part, please contact:

Laura Mash  
MSc Nutrition and Dietetics Student  
c/o Community Dietitian  
Sandringham House  
Castle Courts  
Windsor Street  
Salford  
M5 4DG  
Tel: 0161 212 4038

Dr. Eva Almiron-Roig  
MSc Supervisor  
Department of Biological Sciences  
University of Chester  
Parkgate Road  
Chester  
CH1 4BJ  
Tel: 01244 513124

**Thank you for your participation.**

## **QUESTIONNAIRE**

**1. Please indicate your main area of working\*. (Which ever you choose please answer the following questions in relation to your selection)**

- ☐ Acute (i.e. Hospital based *ONLY*)
- ☐ Mostly Acute
- ☐ Community (i.e. Any location that is non-acute or hospital based *ONLY*)
- ☐ Mostly Community

*\*n.b. this does not relate to employment but to actual place/area of working.*

**2. What screening tool does your trust employ (tick all that apply)?**

- ☐ A single measure (e.g. biochemical/anthropometric or functional index)
- ☐ Malnutrition Universal Screening Tool ('MUST')
- ☐ Mini Nutritional Assessment (MNA)
- ☐ Nutritional Risk Index
- ☐ Registered Nurses Nutritional Risk Classification
- ☐ Subjective Global Assessment (SGA)
- ☐ The Nursing Nutritional Screening Form (NNSF)
- ☐ The Prognostic Nutritional Index (PNI)
- ☐ None
- ☐ Own devised tool
- ☐ Own devised tool based on another published tool (please detail)

.....

- ☐ Other (please detail)

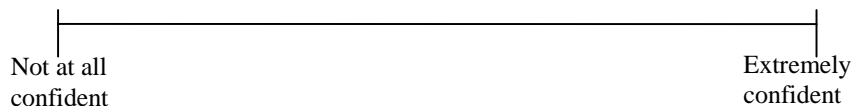
.....

**3. Please mark, with a trait (*a single vertical line*), on the scale below how confident you feel at taking the following measurements:**

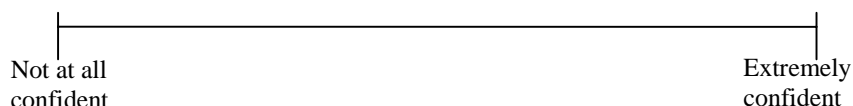
**a. A patient's Height**



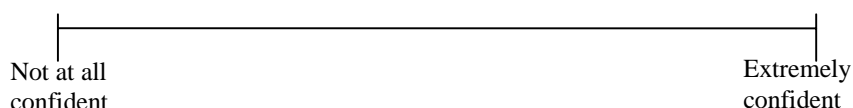
**b. A patient's Weight**



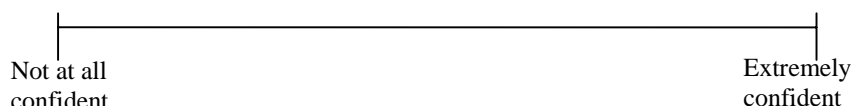
**c. Calculating a patient's BMI**



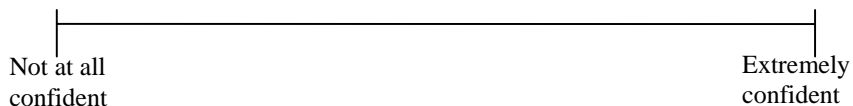
**d. A patient's Skin fold measurement**



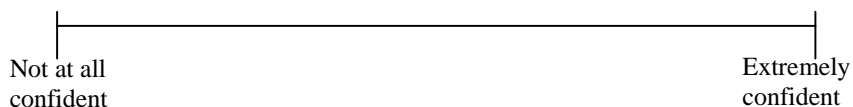
**e. A patient's Mid-Upper Arm Circumference**



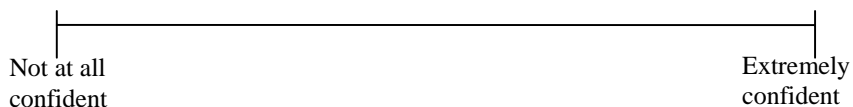
**f. A patient's Demi-span**



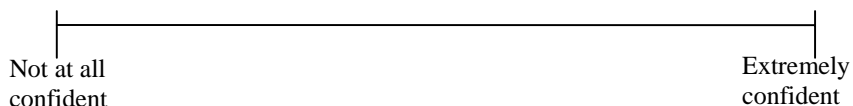
**g. A patient's Knee height**



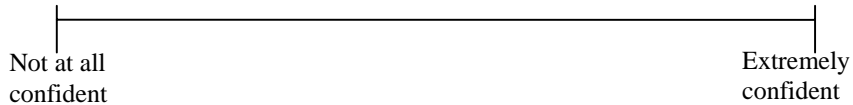
**h. A patient's Ulna length**



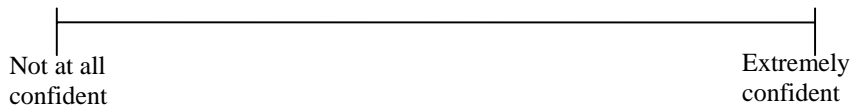
**i. An infant's Head circumference**



**j. A patient's Waist circumference**



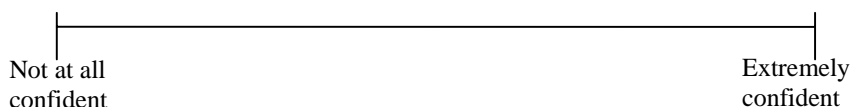
**k. A patient's Hip circumference**



**l. A patient's Waist to Hip ratio**



**m. Measuring body mass via BodPod**



**4. Please tick how often you use each of the measurements below when working as a dietitian or dietetic assistant:**

	<b>Daily</b>	<b>At least Weekly</b>	<b>At least Monthly</b>	<b>Less than Monthly</b>	<b>Never</b>
Measured height					
Estimated height from demi span					
Estimated height from knee height					
Estimated height from ulna length					
Recalled height					
Measured weight					
Estimated weight (eyeball)					
Recalled weight					
BMI					
Triceps skin-folds					
Other skin-fold measures					
Waist circumference					
Hip circumference					
Waist : Hip ratio					
Mid arm circumference (MAC)					
BIA					
DEXA					
Length					
Head circumference					
Height : Age percentile					
Weight : Age percentile					
Height : Weight percentile					
Hand Grip					
Other, please detail:					

**5. Please tick all the reasons that apply to why you may not take/measure anthropometric measurements:**

- ☐ Don't feel I need to
- ☐ Lack of competency
- ☐ Lack of confidence
- ☐ Lack of evidence/not part of evidence-based practice
- ☐ Lack of necessary equipment
- ☐ No accurate/calibrated equipment
- ☐ Lack of training
- ☐ Not appropriate for patient
- ☐ Not required by departmental policy
- ☐ Patients do not like it
- ☐ Time constraints of consultations/work load
- ☐ Too invasive
- ☐ It is taken by other health professionals
- ☐ It is useful in research only
- ☐ Other (please specify)

.....

.....

.....

**6. For the following statements (a – o) please tick your level of agreement in the boxes provided, space has been left for you to provide any comments you wish to at the end of this question:**

	<b>Strongly agree 1</b>	<b>Agree 2</b>	<b>Uncertain 3</b>	<b>Disagree 4</b>	<b>Strongly disagree 5</b>
<b>a.</b> I believe anthropometry measurement taking is part of the unique role of a dietitian	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>b.</b> I believe that nutritional screening is a necessity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>c.</b> I believe that anthropometry is essential when monitoring a patient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>d.</b> I believe that BMI has very limited use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>e.</b> I believe that anthropometry is best taken by other health professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>f.</b> I believe that BMI has very limited use beyond initial screening	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>g.</b> I believe that anthropometry forms a vital part of assessing patients' nutritional status	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>h.</b> I believe that other anthropometric measures are always needed in addition to body weight when assessing a patient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	<b>Strongly agree 1</b>	<b>Agree 2</b>	<b>Uncertain 3</b>	<b>Disagree 4</b>	<b>Strongly disagree 5</b>
<b>i.</b> I believe that skin fold measurements provide little additional information beyond weight alone	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>j.</b> I believe that patients' do not like "invasive" measurements such as skin folds/waist circumference	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>k.</b> I believe that "invasive" anthropometric measures are a barrier within the consultation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>l.</b> I believe that lack of equipment is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>m.</b> For me lack of training is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>n.</b> For me lack of time is the greatest downfall to taking anthropometric measurements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<b>o.</b> I believe that estimated or recalled weight is sufficiently accurate if actual weight is unobtainable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**Any comments:**

**7. What training have you received with regards to taking anthropometric measures, such as taking a patient's weight, height or triceps skin-folds? (tick all that apply)**

- ☐ During university course
- ☐ On-job training
- ☐ External course (please detail)

.....

.....

- ☐ None
- ☐ Other (please detail)

.....

.....

**8. Do you think professionally you would like to attend anthropometric training sessions/course?**

- ☐ Probably Yes – please indicate why:

.....

.....

- ☐ Probably No – please indicate why:

.....

.....

- ☐ Possibly in the future

**9. Please indicate your main area(s) of work at present (tick all that apply):**

- |   |  |
|---|--|
| <input type="checkbox"/> Cancer/oncology            | <input type="checkbox"/> Infectious conditions   |
| <input type="checkbox"/> Cardiovascular disease     | <input type="checkbox"/> Intensive/critical care |
| <input type="checkbox"/> Care of the Elderly        | <input type="checkbox"/> Liver disease           |
| <input type="checkbox"/> Cystic Fibrosis            | <input type="checkbox"/> Mental Health           |
| <input type="checkbox"/> Diabetes                   | <input type="checkbox"/> Metabolic Diseases      |
| <input type="checkbox"/> Eating disorder            | <input type="checkbox"/> Neuroscience            |
| <input type="checkbox"/> Food allergy/intolerance   | <input type="checkbox"/> Nutritional support     |
| <input type="checkbox"/> Gastroenterology           | <input type="checkbox"/> Paediatric              |
| <input type="checkbox"/> General medicine           | <input type="checkbox"/> Palliative care         |
| <input type="checkbox"/> Health Promotion           | <input type="checkbox"/> Renal                   |
| <input type="checkbox"/> HIV/AIDs                   | <input type="checkbox"/> Surgical                |
| <input type="checkbox"/> Home Enteral Tube Feeding  | <input type="checkbox"/> Weight management       |
| <input type="checkbox"/> Other (please specify) ... |  |



**10. Please indicate your gender:**

☐ Male

☐ Female

**11. Please indicate the number of years since you qualified as a registered dietitian/started work as a dietetic assistant:**

☐ 0 – 1 year

☐ >10 – 15 years

☐ >1 – 5 years

☐ >15 – 20 years

☐ >5 – 10 years

☐ >20 years

**12. Please indicate your current grade of working:**

☐ < or equal to Band 3

☐ Band 6

☐ Band 4

☐ Band 7

☐ Band 5

☐ Band 8 or above

**13. Please indicate the number of contracted hours you are employed to work in your current post for the NHS as a dietitian or dietetic assistant:**

☐ < 10 hours per week

☐ >20 – 30 hours per week

☐ 10 – 20 hours per week

☐ >30 – 40 hours per week

**This completes the questionnaire.**

**Once again, thank you for your time!**

### **7.2. Appendix 2: Ethics:**

- University of Chester Research Ethics Committee letter;
- NRES and IRAS exemption letter;
- Letter of consent from SRFT manager.

Laura Mash

3<sup>rd</sup> July 2009

Dear Laura,

***Study title: Determinants of anthropometric measurement use amongst dietitians.***

***FREC reference: 339/09/LM/BIOL***

***Version number: 1***

The above application was considered by the Faculty Research Ethics Committee at the meeting held on 24<sup>th</sup> June 2009.

### **Provisional opinion**

*The Committee would be content to give a favourable ethical opinion of the research, subject to receiving a complete response to the request for further information set out below.*

Authority to consider your response and to confirm the Committee's opinion has been delegated to Mohammed Saeed (Lead Reviewer).

### **Further information or clarification**

- Confusion regarding participant's consent (page 16 implicit). Page 20 – informed consent to be obtained. If latter, no consent form attached. Requires clarification.
- Scales on Questionnaire require discussion with Supervisor. Scale used on page 31 is too large.
- Assurance that the second part of the pilot study questionnaire is completed as part of the study design. Page 14 states same set of pilot participants as part of the validation. Clarification required.

- Appendix H: Pilot Questionnaire - 'Patient' Information Sheet should read 'Participant Information Sheet'.
- Note statistical review.

When submitting a response to the Committee, please send **three copies** of your revised documentation, where appropriate, underlining or otherwise highlighting the changes you have made and giving revised version numbers and dates where appropriate. **Responses should be submitted within three months of the date of this letter.** You do not need to resubmit your application. Please send your response to Mrs. Karen Murray, FREC Secretary, Centre for Public Health Research, University of Chester, Parkgate Road, Chester CH1 4BJ.

The Committee will confirm the final ethical opinion on the application within a maximum of 15 working days from receipt of an appropriate and acceptable response.

## Membership of the Committee

The members of the Faculty Research Ethics Committee who were present at the meeting are listed on the attached sheet.

Yours sincerely,

---

**Mohammed Saeed**

Chair, Faculty Research Ethics Committee

***Enclosures: \* List of names of members who were present at the meeting and those who***

***submitted written comments***

- \* Statistician's comments, where applicable
- \* Response to FREC template

c.c.: Supervisor  
FREC Departmental/Centre Representative

**Statistical Feedback**

Application: 339/09/LM/BIOL

Study Design: This appears to have been considered in some detail. However, targeting all of the North West region NHS trusts does not justify extrapolating the results to the whole of the UK (see page 13, paragraph 1).

Proposed analysis: A scatter plot requires both variables to be interval measures (see page 15, top of page), so the proposed plot is inappropriate to compare the results for acute and community dietitians. A boxplot would be more suitable.

Sample size: The proposed number of responses (150) could well be necessary for some of the  $\chi^2$  tests where the questions have a large number (11) of options.

**Email Reply from NRES:**

**Exemption from NRES Ethics Process**

Your query was reviewed by our Queries Line Advisers.

Our leaflet "Defining Research", which explains how we differentiate research from other activities, is published at:

<http://www.nres.npsa.nhs.uk/rec-community/guidance/#researchoraudit>

Based on the information you provided, our advice is that the project is not considered to be research according to this guidance. Therefore it does not require ethical review by a NHS Research Ethics Committee.

**Service Evaluation**

If you are undertaking the project within the NHS, you should check with the relevant NHS care organisation(s) what other review arrangements or sources of advice apply to projects of this type. Guidance may be available from the clinical governance office.

Although ethical review by a NHS REC is not necessary in this case, all types of study involving human participants should be conducted in accordance with basic ethical principles such as informed consent and respect for the confidentiality of participants. When processing identifiable data there are also legal requirements under the Data Protection Act 2000. When undertaking an audit or service/therapy evaluation, the investigator and his/her team are responsible for considering the ethics of their project with advice from within their organisation. University projects may require approval by the university ethics committee.

This response should not be interpreted as giving a form of ethical approval or any endorsement of the project, but it may be provided to a journal or other body as evidence that ethical approval is not required under NHS research governance arrangements.

However, if you, your sponsor/funder or any NHS organisation feel that the project should be managed as research and/or that ethical review by a NHS REC is essential, please write setting out your reasons and we will be pleased to consider further.

Where NHS organisations have clarified that a project is not to be managed as research, the Research Governance Framework states that it should not be presented as research within the NHS.

Regards

**Streamline your research application process with IRAS (Integrated Research Application System). To view IRAS and for further information visit [www.myresearchproject.org.uk](http://www.myresearchproject.org.uk)**

Queries Line  
National Research Ethics Service  
National Patient Safety Agency  
4-8 Maple Street  
London  
W1T 5HD Website: [www.nres.npsa.nhs.uk](http://www.nres.npsa.nhs.uk)  
Email: [queries@nres.npsa.nhs.uk](mailto:queries@nres.npsa.nhs.uk) Ref: 04/02

Salford Royal NHS Foundation Trust  
Salford Royal Hospital  
Stott Lane  
Salford  
M6 8HD  
Tel: 0161 206 5441  
Date: 03/06/2009

To whom it may concern,

As dietetic manager at Salford Royal NHS Foundation Trust/Salford PCT I hereby give consent for my employee Laura Mash to pilot her questionnaire, which formulates part of her MSc Research project, at the above named trust.

Yours Faithfully,



Mrs. Diane Green  
Dietetic Manager

### **7.3. Appendix 3: Dietetic Departments:**

- List of all NHS trusts within North West of England
- Telephone script.



<http://www.nhs.uk/England/AuthoritiesTrusts/Acute/mapSearch.aspx?RegionCode=Q31>

NHS Primary Care Trusts (PCTs) in North West

1. [Ashton, Leigh and Wigan PCT](#)  
Bryan House, 61-69 Standishgate, Wigan, Lancashire, WN1 1AH  
Tel: 01942 482711
2. [Blackburn With Darwen PCT](#)  
The Guide Business Centre, School Lane, Guide, Blackburn, Lancashire, BB1 2QH  
Tel: 01254 267 000
3. [Blackpool PCT](#)  
Seasider's Way, Blackpool, Lancashire, FY1 6JX  
Tel: 01253 651 200
4. [Bolton PCT](#)  
St. Peters House, Silverwell Street, Bolton, Lancashire, BL1 1PP  
Tel: 01204 377000
5. [Bury PCT](#)  
21 Silver Street, Bury, Lancashire, BL9 0EN  
Tel: 0161 762 3100
6. [Central and Eastern Cheshire PCT](#)  
Barony Road, Nantwich, Cheshire, CW5 5QU  
Tel: 01270 415300
7. [Central Lancashire PCT](#)  
Jubilee House, Lancashire Enterprise Business, Leyland, Lancashire, PR26 6TR  
Tel: 01772 644400
8. [Cumbria PCT](#)  
4 Wavell Drive, Rosehill Industrial Estate, Carlisle, Cumbria, CA1 2SE  
Tel: 01228 602000
9. [East Lancashire PCT](#)  
31-33 Kenyon Road, Brierfield, Nelson, Lancashire, BB9 5SZ  
Tel: 01282 619909
10. [Halton and St Helens PCT](#)  
Victoria House, Holloway, Runcorn, Cheshire, WA7 4TH  
Tel: 01928 593600
11. [Heywood, Middleton and Rochdale PCT](#)  
3rd and 5th Floors, Telegraph House, Baillie Street, Rochdale, Lancashire, OL16 1JA  
Tel: 01706 652800
12. [Knowsley PCT](#)  
Po Box 23, Nutgrove Villa, Westmorland Road, Huyton, Liverpool, Merseyside, L36 6GA  
Tel: 0151 443 4900

13. [Liverpool PCT](#)  
1 Arthouse Square, 67-69 Seel Street, Liverpool, Merseyside, L1 4AZ  
Tel: 0151 296 7000
14. [Manchester PCT](#)  
Gateway House, Piccadilly South, Manchester, Greater Manchester, M60 7LP  
Tel: 0161 958 4000
15. [North Lancashire PCT](#)  
Derby Road, Wesham, Preston, Lancashire, PR4 3AL  
Tel: 01253 306305
16. [Oldham PCT](#)  
Ellen House, Waddington Street, Oldham, Lancashire, OL9 6EE  
Tel: 0161 622 6500
17. [Salford PCT](#)  
Suite 19, 21-23, Fifth Floor, St. James House, Pendleton Way, Salford, Lancashire, M6 5FW  
Tel: 0161 212 4800
18. [Sefton PCT](#)  
Burlington House, Crosby Road North, Liverpool, Merseyside, L22 0QB  
Tel: 0151 920 5056
19. [Stockport PCT](#)  
8th Floor, Regent House, Heaton Lane, Stockport, Cheshire, SK4 1BS  
Tel: 0161 426 5000
20. [Tameside and Glossop PCT](#)  
New Century House, Windmill Lane, Denton, Manchester, Greater Manchester, M34 2JF  
Tel: 0161 304 5300
21. [Trafford PCT](#)  
2nd Floor, Oakland House, Talbot Road, Old Trafford, Manchester, Greater Manchester, M16 0PQ  
Tel: 0161 873 9500
22. [Warrington PCT](#)  
930 - 932 Birchwood Boulevard, Birchwood, Warrington, Cheshire, WA3 7QN  
Tel: 01925 843600
23. [Western Cheshire PCT](#)  
1829 Building, The Countess Of Chester Health, Liverpool Road, Chester, Cheshire, CH2 1HJ  
Tel: 01244 650300
24. [Wirral PCT](#)  
Admin Block, St. Catherines Hospital, Church Road, Birkenhead, Merseyside, CH42 0LQ  
Tel: 0151 651 0011

### **NHS Acute (Hospital) Trusts in North West**

1. [Aintree University Hospitals NHS Foundation Trust](#)  
University Hospital Aintree, Fazakerley Hospital, Lower Lane, Liverpool, Merseyside, L9 7AL  
**Tel:** 0151 525 5980
2. [Blackpool, Fylde and Wyre Hospitals NHS Trust](#)  
Victoria Hospital, Whinney Heys Road, Blackpool, Lancashire, FY3 8NR  
**Tel:** 01253 300000
3. [Bolton Hospitals NHS Trust](#)  
The Royal Bolton Hospital, Minerva Road, Farnworth, Bolton, Lancashire, BL4 0JR  
**Tel:** 01204 390390
4. [Central Manchester and Manchester Children's University Hospitals NHS Trust](#)  
Trust Headquarters, Cobbett House, Manchester Royal Infirmary, Oxford Road, Manchester, Greater Manchester, M13 9WL  
**Tel:** 0161 276 1234
5. [Christie Hospital NHS Trust](#)  
550 Wilmslow Road, Withington, Manchester, Greater Manchester, M20 4BX  
**Tel:** 0845 226 3000
6. [Clatterbridge Centre For Oncology NHS Foundation Trust](#)  
Clatterbridge Road, Bebington, Wirral, Merseyside, CH63 4JY  
**Tel:** 0151 334 1155
7. [Countess Of Chester Hospital NHS Foundation Trust](#)  
The Countess Of Chester Health Park, Chester, Cheshire, CH2 1UL  
**Tel:** 01244 365 000
8. [East Cheshire NHS Trust](#)  
Macclesfield District Gen Hospital, Victoria Road, Macclesfield, Cheshire, SK10 3BL  
**Tel:** 01625 421000
9. [East Lancashire Hospitals NHS Trust](#)  
Royal Blackburn Hospital, Haslingden Road, Blackburn, Lancashire, BB2 3HH  
**Tel:** 01254 263555
10. [Lancashire Teaching Hospitals NHS Foundation Trust](#)  
Chief Executive's Office, Royal Preston Hospital, Sharoe Green Lane, Fulwood, Preston, Lancashire, PR2 9HT  
**Tel:** 01772 716565/ 01257 261222
11. [Liverpool Women's NHS Foundation Trust](#)  
Liverpool Womens Hospital, Crown Street, Liverpool, Merseyside, L8 7SS  
**Tel:** 0151 708 9988
12. [North Cheshire Hospitals NHS Trust](#)  
Warrington Hospital, Lovely Lane, Warrington, Cheshire, WA5 1QG  
**Tel:** 01925 635911

13. [North Cumbria Acute Hospitals NHS Trust](#)  
West Cumberland Hospital, Hensingham, Whitehaven, Cumbria, CA28 8JG  
**Tel:** 01946 693181
14. [Pennine Acute Hospitals NHS Trust](#)  
Trust Headquarters, North Manchester General Hospital, Delaunays Road,  
Manchester, Lancashire, M8 5RB  
**Tel:** 0161 624 0420
15. [Royal Liverpool and Broadgreen University Hospitals NHS Trust](#)  
Royal Liverpool University Hospital, Prescot Street, Liverpool, Merseyside, L7 8XP  
**Tel:** 0151 706 2000
16. [Royal Liverpool Childrens NHS Trust](#)  
Alder Hey Hospital, Eaton Road, West Derby, Liverpool, Merseyside, L12 2AP **Tel:**  
0151 228 4811
17. [Salford Royal NHS Foundation Trust](#)  
Hope Hospital, Stott Lane, Salford, Lancashire, M6 8HD  
**Tel:** 0161 789 7373
18. [Southport and Ormskirk Hospital NHS Trust](#)  
Town Lane, Southport, Merseyside, PR8 6PN  
**Tel:** 01704 547471
19. [St Helens and Knowsley Hospitals NHS Trust](#)  
Whiston Hospital, Warrington Road, Prescot, Merseyside, L35 5DR  
**Tel:** 0151 426 1600
20. [Stockport NHS Foundation Trust](#)  
Stepping Hill Hospital, Poplar Grove, Stockport, Cheshire, SK2 7JE  
**Tel:** 0161 483 1010
21. [Tameside and Glossop Acute Services NHS Trust](#)  
Tameside General Hospital, Fountain Street, Ashton-under-Lyne, Lancashire, OL6  
9RW  
**Tel:** 0161 331 6000
22. [The Cardiothoracic Centre - Liverpool NHS Trust](#)  
Thomas Drive, Liverpool, Merseyside, L14 3PE  
**Tel:** 0151 228 1616
23. [The Mid Cheshire Hospitals NHS Trust](#)  
Leighton Hospital, Leighton, Crewe, Cheshire, CW1 4QJ  
**Tel:** 01270 255141
24. [Trafford Healthcare NHS Trust](#)  
Trafford General Hospital, Moorside Road, Urmston, Manchester, Greater  
Manchester, M41 5SL  
**Tel:** 0161 748 4022
25. [University Hospital Of South Manchester NHS Foundation Trust](#)  
Wythenshawe Hospital, Southmoor Road, Wythenshawe, Manchester, Greater  
Manchester, M23 9LT **Tel:** 0161 998 7070

26. [University Hospitals Of Morecambe Bay NHS Trust](#)  
Westmorland General Hospital, Burton Road, Kendal, Cumbria, LA9 7RG  
**Tel:** 01539 795366
27. [Walton Centre For Neurology and Neurosurgery NHS Trust](#)  
Lower Lane, Liverpool, Merseyside, L9 7LJ  
**Tel:** 0151 525 3611
28. [Wirral Hospital NHS Trust](#)  
Arrowe Park Hospital, Arrowe Park Road, Upton, Wirral, Merseyside, CH49 5PE  
**Tel:** 0151 678 5111
29. [Wrightington, Wigan and Leigh NHS Trust](#)  
The Elms, Royal Albert Edward Infirmary, Wigan Lane, Wigan, Lancashire, WN1 2NN  
**Tel:** 01942 244000

Telephone script.

Trust:	
Introduction	Hello my name is Laura, I am a MSc student at the University of chester would it be possible to speak with your manager please?
Manager	
Introduce project	I am conducting a dissertation looking at Anthropometry use amongst dietitians. I am hoping to target all NHS working dietitians in the North West of England as so to be able to compare different dietitian working groups. Would it be possible for me to send your department a short questionnaire to complete?
Answer	
Information re: questionnaire	The questionnaire has 13 questions and will take approx 5-10 mins to complete. I will send one questionnaire to each of your dietitians and dietetic assistants which will have a self addressed/freepost envelop attached, so you wont have any associated costs.
How many dietitians are there in your department?	
I will provide 2 follow-up reminders, how would you like me to contact you in the future, Email or telephone?	
Confirm contact details	
Close	Thank you very much for your time.